MODEL 181
AUTO-INDEX
SPIN / RELIEF
REEL MOWER GRINDER

OPERATORS
MANUAL

WARNING

You must thoroughly read and understand this manual before operating the equipment, paying particular attention to the Warning & Safety instructions.

18200 (11-05)

SAFETY INSTRUCTIONS

Safety Awareness Symbols are inserted into this manual to alert you to possible ***Safety Hazards***. Whenever you see these symbols, follow their instructions.

The ***Warning Symbol*** identifies special instructions or procedures which, if not correctly followed, could result in personal injury.

The ***Caution Symbol*** identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.

1. **KEEP GUARDS IN PLACE** and in working order.
2. **REMOVE WRENCHES AND OTHER TOOLS.**
3. **KEEP WORK AREA CLEAN.**
4. **DON'T USE IN DANGEROUS ENVIRONMENT.** Don't use Grinder in damp or wet locations. Machine is for indoor use only. Keep work area well lit.
5. **KEEP ALL VISITORS AWAY.** All visitors should be kept a safe distance from work area.
6. **MAKE WORK AREA CHILD-PROOF** with padlocks or master switches.
7. **DON'T FORCE THE GRINDER.** It will do the job better and safer if used as specified in this manual.
8. **USE THE RIGHT TOOL.** Don't force the Grinder or an attachment to do a job for which it was not designed.
9. **WEAR PROPER APPAREL.** Wear no loose clothing, gloves, neckties, or jewelry which may get caught in moving parts. Nonslip footwear is recommended. Wear protective hair covering to contain long hair.
10. **ALWAYS USE SAFETY GLASSES.**
11. **SECURE YOUR WORK.** Make certain that the cutting unit is securely fastened with the clamps provided before operating.
12. **DON'T OVERREACH.** Keep proper footing and balance at all times.
13. **MAINTAIN GRINDER WITH CARE.** Follow instructions in Service Manual for lubrication and preventive maintenance.
14. **DISCONNECT POWER BEFORE SERVICING,** or when changing the grinding wheel.
15. **REDUCE THE RISK OF UNINTENTIONAL STARTING.** Make sure the switch is OFF before plugging in the Grinder.
16. **USE RECOMMENDED ACCESSORIES.** Consult the manual for recommended accessories. Using improper accessories may cause risk of personal injury.
17. **CHECK DAMAGED PARTS.** A guard or other part that is damaged or will not perform its intended function should be properly repaired or replaced.
18. **NEVER LEAVE GRINDER RUNNING UNATTENDED. TURN POWER OFF.** Do not leave grinder until it comes to a complete stop.
19. **KNOW YOUR EQUIPMENT.** Read this manual carefully. Learn its application and limitations as well as specific potential hazards.
20. **KEEP ALL SAFETY DECALS CLEAN AND LEGIBLE.** If safety decals become damaged or illegible for any reason, replace immediately. Refer to replacement parts illustrations in Service Manual for the proper location and part numbers of safety decals.
21. **DO NOT OPERATE GRINDER WHEN UNDER THE INFLUENCE OF DRUGS, ALCOHOL, OR MEDICATION.**

SAFETY INSTRUCTIONS

IMPROPER USE OF GRINDING WHEEL MAY CAUSE BREAKAGE AND SERIOUS INJURY.

Grinding is a safe operation if the few basic rules listed below are followed. These rules are based on material contained in the ANSI B7.1 Safety Code for "Use, Care and Protection of Abrasive Wheels". For your safety, we suggest you benefit from the experience of others and carefully follow these rules.

DO

1. **DO** always **HANDLE AND STORE** wheels in a **CAREFUL** manner.
2. **DO VISUALLY INSPECT** all wheels before mounting for possible damage.
3. **DO CHECK MACHINE SPEED** against the established maximum safe operating speed marked on wheel.
4. **DO CHECK MOUNTING FLANGES** for equal and correct diameter.
5. **DO USE MOUNTING BLOTTERS** when supplied with wheels.
6. **DO** be sure **WORK REST** is properly adjusted.
7. **DO** always **USE A SAFETY GUARD COVERING** at least one-half of the grinding wheel.
8. **DO** allow **NEWLY MOUNTED WHEELS** to run at operating speed, with guard in place, for at least one minute before grinding.
9. **DO** always **WEAR SAFETY GLASSES** or some type of eye protection when grinding.

DON'T

1. **DON'T** use a cracked wheel or one that **HAS BEEN DROPPED** or has become damaged.
2. **DON'T FORCE** a wheel onto the machine **OR ALTER** the size of the mounting hole - if wheel won't fit the machine, get one that will.
3. **DON'T** ever **EXCEED MAXIMUM OPERATING SPEED** established for the wheel.
4. **DON'T** use mounting flanges on which the bearing surfaces **ARE NOT CLEAN, FLAT AND FREE OF BURRS.**
5. **DON'T TIGHTEN** the mounting nut excessively.
6. **DON'T** grind on the **SIDE OF THE WHEEL** (see Safety Code B7.2 for exception).
7. **DON'T** start the machine until the **WHEEL GUARD IS IN PLACE.**
8. **DON'T JAM** work into the wheel.
9. **DON'T STAND DIRECTLY IN FRONT** of a grinding wheel whenever a grinder is started.
10. **DON'T FORCE GRINDING** so that motor slows noticeably or work gets hot.

AVOID INHALATION OF DUST generated by grinding and cutting operations. Exposure to dust may cause respiratory ailments. Use approved NIOSH or MSHA respirators, safety glasses or face shields, and protective clothing. Provide adequate ventilation to eliminate dust, or to maintain dust level below the Threshold Limit Value for nuisance dust as classified by OSHA.

GETTING TO KNOW YOUR GRINDER

This machine is intended for reel mower reel blade grinding ONLY.
Any use other than this may cause personal injury and void the warranty.

To assure the quality and safety of your machine and to maintain the warranty, you MUST use original equipment manufactures replacement parts and have any repair work done by a qualified professional.

ALL operators of this equipment must be thoroughly trained BEFORE operating the equipment.

Do not use compressed air to clean grinding dust from the machine. This dust can cause personal injury as well as damage to the grinder.

Adjustable Reel Clamping Mechanisms for ease of installation. One chain vise grips included to secure any size roller.

Positive Vertical and Horizontal Reel Adjustments for fast alignment of the reel in the machine.

Dial Indicator Setup Gauge to align reels with accuracy up to .001".

Accessible Control Panel with independent switches for grinding motor, carriage traverse with variable speed control, spin drive with variable speed control, and a safety stop button.

Positive Infeed and Height Adjustment for exact positioning of the reel and measured metal removal.

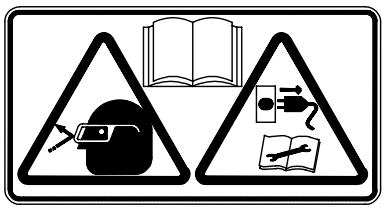
Electro-Magnetic Traversing Switch for easily adjustable traversing length.

FIG. 1

SPECIFICATIONS

Traversing Switches	Solid state, non-contacting proximity switches
Carriage Travel	38" [97 cm]
Overall Width	67" [170 cm]
Overall Height	58" [147 cm] Machine, 83" [211 cm] Boom
Overall Depth	42" [107 cm]
Weight	817 lbs [371 kg] Machine Weight, 1000 lbs. [454 kg] Shipping Weight
Base Construction	Precision Machined heavy duty reinforced welded steel base
Carriage Rails	Precision Ground, Hardened Steel 1.000 Dia. [25.4 mm]
Grind Head Motor	3/4 HP at 60 HZ, 5/8 HP at 50 HZ, 3450 RPM at 60 HZ, 2875 RPM at 50 HZ
Elevator	400 lbs. [180 kg] capacity
Spin Drive	Reversible variable speed 0-380 RPM DC Gear Motor .20 Hp
Sound Level	More than 75 Dba, Less than 95 Dba
Auto Traverse	Belt drive with variable speed control and overload protection
Grinding Head	90 degrees rotatable head with pin lock locations for grinding bedknives
Control System	Reversible Spin drive with variable spin speed or variable relief torque
Control System	Variable traverse speed control

GETTING TO KNOW YOUR GRINDER (Continued)



Symbols for Read operators manual, wear safety glasses and disconnect power before servicing.

Symbol to keep visitors a safe distance away from the grinder.

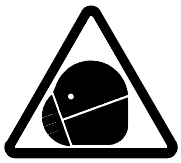
Symbol for sharp object which will cause serious injury.

Symbol for hot surface which could cause burns.

Symbol for caution relating to RPM of the motor and minimum safe rated RPM of the grinding wheel.

Symbol identifying a panel, cover, or area as having live electrical components within.

Symbol for hearing protection required when operating this machine



Symbol that operators and people in the close proximity must wear respirators or have adequate ventilation systems.

Symbol for maximum weight capacity for winch

Symbol to keep exposed gasoline or flammables away from the grinder because it operates with a large amount of sparks.

LOW VOLTAGE RELAY

The grinder is equipped with a low voltage relay which is factory preset at 100 VAC. If the power supply line does not deliver 100 VAC power under load, the relay will open and trip out the starter. If this occurs, your power supply line is inadequate and must be correct before proceeding further with the grinder.

DAILY MAINTENANCE BY THE OPERATOR

On a daily basis, clean the grinder by wiping it off.
On a daily basis, remove all grinding grit from the grinding head and traverse rail areas.
On a daily basis, inspect the grinder for loose fasteners or components and tighten.
Contact your company's Maintenance Department if damaged or defective parts are found.

DO NOT USE COMPRESSED AIR TO CLEAN GRINDING DUST FROM THE GRINDER.

GETTING TO KNOW YOUR GRINDER (Continued)

GETTING TO KNOW YOUR MACHINE

The following is an explanation of the machine components you will be using when setting up reels to grind on your new Spin Grinder. You should familiarize yourself with each part as this grinder has been engineered to spin and relief grind almost every type and make of reel mower available today. Adjustment of the various fixtures will be necessary for different types of reels.

FIG. 2

OVERHEAD MOWER CLAMP ASSEMBLY

Each overhead mower clamp assembly consists of two rectangular bar clamps (top and bottom), which also contain adjustable holding fixtures into which is placed the mower clamps. These clamps will be positioned on the overhead square bar as shown in FIG. 2 and FIG 3. They are designed to lock into place and not move during the grinding procedure. Included are two sizes of clamp lips, normally the smaller will be used.

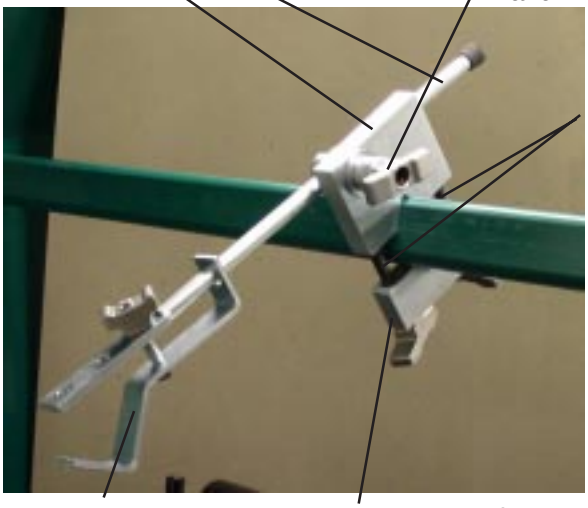


FIG. 3

ROLLER SUPPORTS

There are two roller supports that are mounted to the square mounting bar so that the "V" faces the back of the machine and the offset can be mounted high or low. The roller brackets can also face upward with the offset either forward or to the rear. See FIG. 4.

THE HAND KNOBS ON THE SQUARE BAR MUST BE VERY TIGHT OR THE REEL CAN LOOSEN CAUSING POOR GRIND QUALITY.

FIG. 4

CENTER MOUNTING BRACKETS

The centers mounting brackets consist of a stationary center bracket and an adjustable center bracket. The stationary bracket will normally be used on the right hand side of the mounting bar when facing the reel loading position. See FIG. 5. These centering fixtures are used primarily on greens mowers and the **OPTIONAL** Bedknife Attach Kit 6000555.

FIG. 5

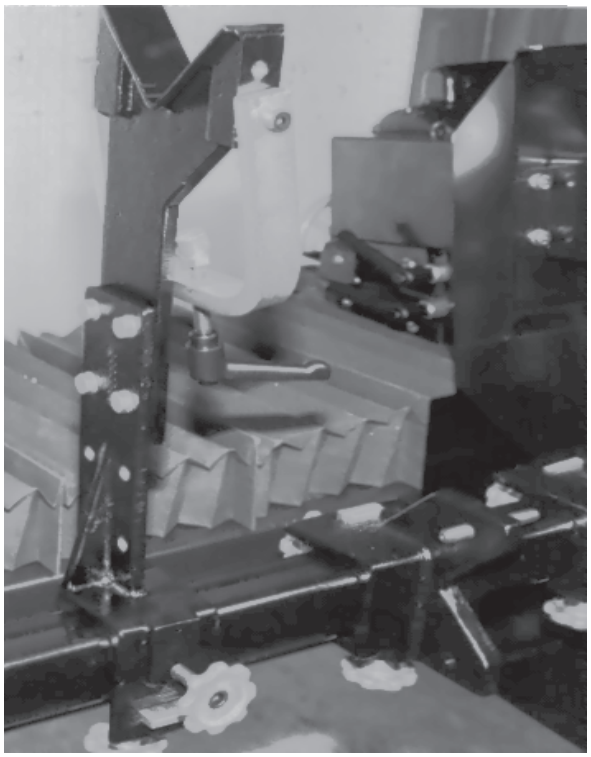


FIG. 6

OPTIONAL PULL GANG BRACKETS

The **OPTIONAL** Pull Gang Reel Mount Kit 18574 consists of a lower mounting bracket that fits over the square tooling mounting bar and two threaded locking screws. Attached to this is the upper "V" bracket that cradle the reel hub when in position. There are three vertical adjustments on this fixture, but will normally be used in the upper hole position. See FIG. 6.

These brackets can be mounted on the square mounting bar with offset either forward or backwards, but the normal position will be with the "V" centered over the bar or with the offset facing the back of the machine. The hold-down swing arm has an upper and lower mounting position depending on mower hub size.

The rear roller of the pull gang mowing unit attaches to the roller supports as shown in FIG. 7.

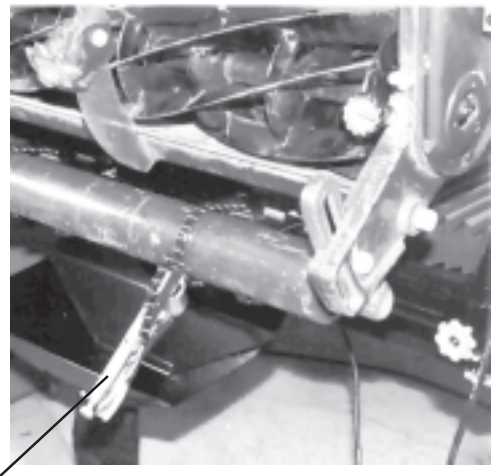


FIG. 7

Vice Grip Chain Clamp

GETTING TO KNOW YOUR GRINDER (Continued)

TRAVERSE ACTUATOR RELEASE

The actuator that drives the grinding carriage left and right can be released to allow manual movement of the grinding carriage. The actuator release arm is located at the front of the carriage under the infeed handwheel. See FIG. 8. Rotate the release arm up to release actuator and rotate the release arm down to engage actuator.

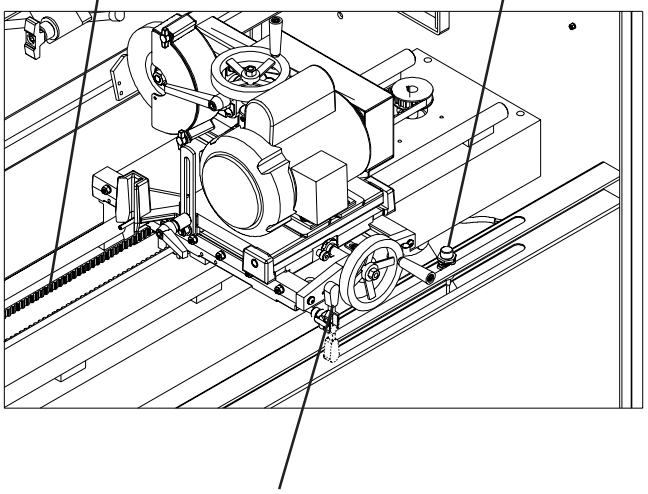


FIG. 8

PROXIMITY SENSORS

The Spin Relief Grinder is equipped with proximity sensors to change the traversing directions. These are adjustable by sliding them along the rail to control traverse distance. See FIG. 10.

FIG. 10

GRINDING WHEEL AND GUARD FOR SPIN GRINDING

Spin grinding requires a 1.00" wide [25.4 mm] grinding wheel and a simple flat grinding wheel guard. See FIG. 11.

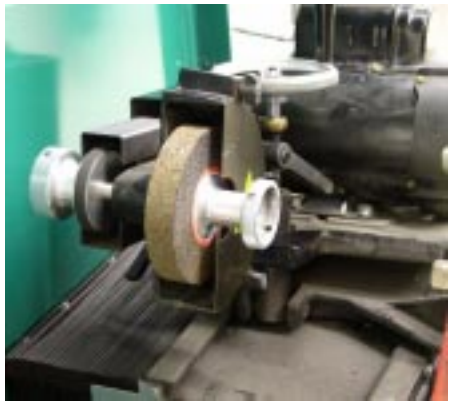


FIG. 11

GRINDING WHEEL AND FINGER - GUARD ASSEMBLY FOR RELIEF GRINDING

Relief grinding requires a 3/8" .375" [9.5 mm] grinding wheel and a wheel guard that carries the fixed relief finger and the moveable index finger. See FIG. 12.

FIG. 12

RELIEF GRINDING FINGER ADJUSTMENTS

The relief Index Finger Assembly has three adjustments as follows:

1. The index pin is adjustable in height with the loosening of its locking setscrew. The height of the finger can be raised to catch the next blade on small diameter reels or it can be lowered to avoid interference with the reel spider. See FIG. 13.

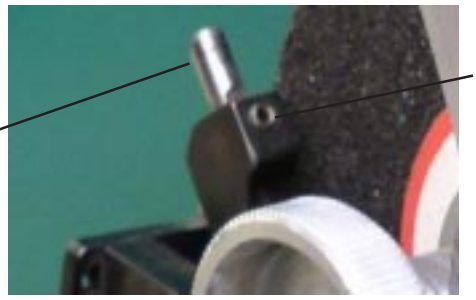


FIG. 13

2. The moveable finger has a knob to limit the amount of back travel. The back travel of the finger is limited so the reel blade makes a smooth transition from the moveable finger onto the fixed finger without interferences. The fixed finger is the working finger during the grind. See FIG. 14.

FIG. 14

3. The lock handle on the side of the guard/ carrier plate is an adjustment for grinding wheel wear. Use this to hold the fingers in the correct position to the grinding wheel. See FIG. 15.

FIG. 15

DIAL INDICATOR SET UP FIXTURE

The dial indicator set up fixture is designed to be quickly mounted into position and/or quickly removed.

The fixture is mounted to the front left corner of the grinding head assembly as shown in FIG. 16.

When the fixture is not in use, it is quickly removed and can be stored on the tool tray.

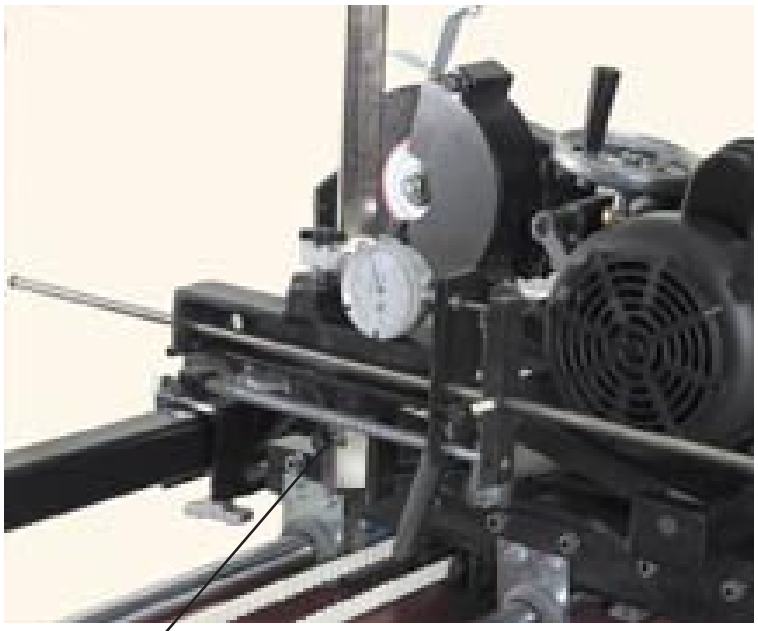


FIG. 16

CONTROL PANEL

The control panel has 10 control switches and knobs. See FIG 17. Details of the function of each are shown on pages 12,13 and 14. Additionally, there are two circuit breakers on the control panel. The 10 amp circuit breaker is to protect the grinding motor circuit and the 4 amp circuit breaker is to protect the spin drive circuit.

FIG. 17

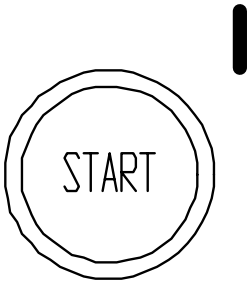
GETTING TO KNOW YOUR GRINDER (Continued)

CONTROL PANEL COMPONENT IDENTIFICATION
Review the following control panel component descriptions before proceeding with the instructions

SYSTEM START SWITCH

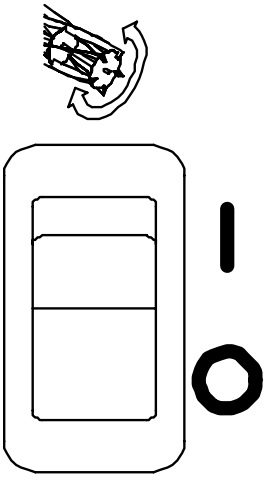
Powers all control panel systems.
Pulls in the main magnetic starter.

NOTE: The guard doors must be shut and all switches must be off for the machine to start.



SPIN DRIVE SWITCH ON/OFF

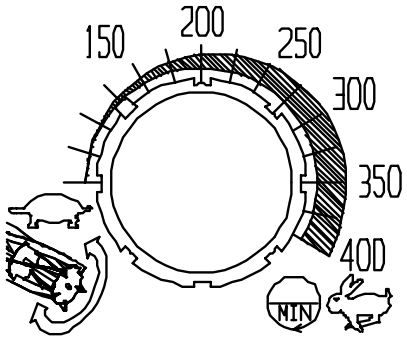
Turns the spin drive motor ON/OFF.
Guard doors must be shut for the spin drive to operate.



SPIN SPEED DIAL

RPM

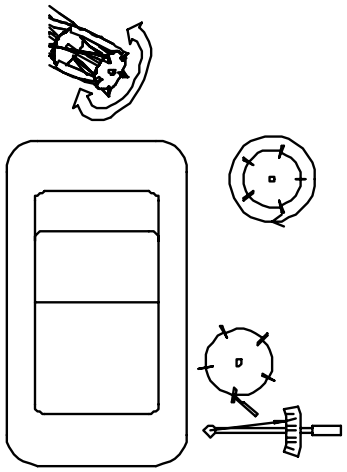
Adjusts the speed of reel rotation when you have the grind selector switch set at variable speed spin.



GRIND SELECTOR SWITCH

Variable Speed Spin
Switch must be up to perform spin grinding operations.

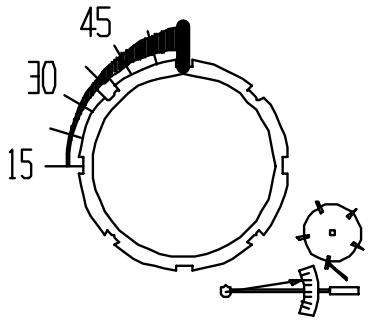
Variable Torque Relief
Switch must be down to perform relief grinding operations.



GETTING TO KNOW YOUR GRINDER (Continued)

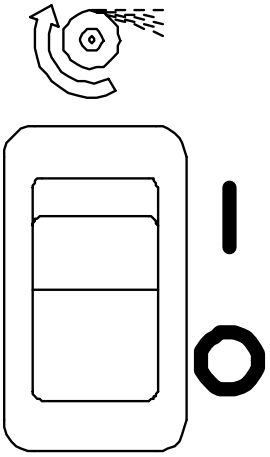
RELIEF TORQUE DIAL

Adjusts the Spin Drive Motor torque (the torque holding the reel blade to the relief finger) when Grind Selector Switch is set at variable Torque Relief.



GRINDING WHEEL MOTOR SWITCH
ON / OFF

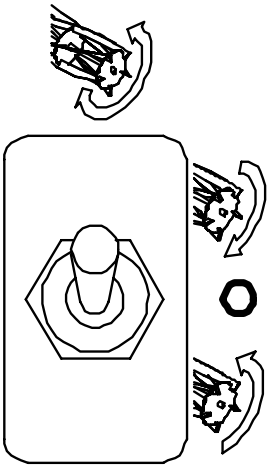
Turns the Grinding Wheel Motor on and off. Guard doors must be shut for Grinding Motor to operate.



SPIN DRIVE ROTATION SWITCH
Forward / Off / Reverse

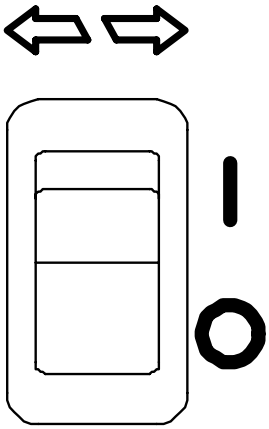
This switch reverses rotation of the spin drive motor. Toggle in middle is off position and stops rotation. NOTE : Because the spin drive can mount on either side of the reel, rotation direction will vary.

THE MOTOR MUST COME TO A COMPLETE STOP BEFORE CHANGING DIRECTIONS. IF THE MOTOR DOES NOT COME TO A COMPLETE STOP, SERIOUS DAMAGE TO THE CONTROL MAY RESULT.



TRAVERSE MOTOR SWITCH
ON/OFF

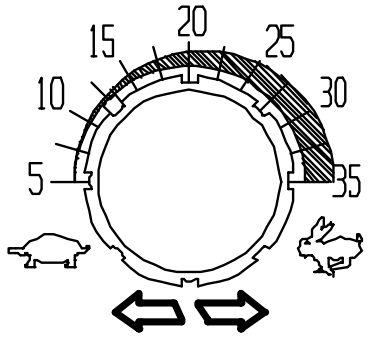
Turns the traverse drive motor on and off.



GETTING TO KNOW YOUR GRINDER (Continued)

TRAVERSE SPEED DIAL - FT / MIN

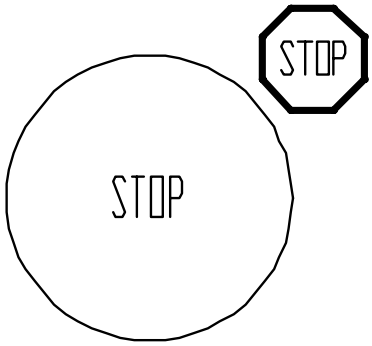
Adjusts the speed of the left & right movement of the grinding wheel carriage.



EMERGENCY STOP BUTTON

Cuts all power to the control panel functions. Stops all motors, including grinding motor, traverse motor, spin motor, etc. To restore power, pull up on the button and press the start button.

PUSHING THE EMERGENCY STOP BUTTON DOES NOT STOP ALL POWER TO THE GRINDER. POWER IS STILL DELIVERED TO THE INFEED SIDE OF THE MAGNETIC CONTACTOR. DISCONNECT THE CORD AT THE WALL OUTLET BEFORE PERFORMING SERVICE.



SAFETY INSTRUCTIONS

PLEASE TAKE SPECIAL NOTE OF THE FOLLOWING WARNING DECAL LOCATED NEAR THE WINCH OF THE MODEL 181.

--WARNING--

1. Lifting winch capacity 400 lbs. maximum.
2. Always have the lifting hooks securely attached and balanced on the cutting unit before lifting.
3. Stand well clear of the cutting unit when winching into position. Guide with extended arms only.
4. The winch is equipped with a safety ratchet. Do not defeat or override this safety feature.
5. Read warning label on winch handle and the assembly and operating manual before using the winch.

OPERATING INSTRUCTIONS

PREPARE MOWER FOR SHARPENING

Preparation of the mowing unit prior to sharpening.
It is recommended that the mowing unit to be sharpened is thoroughly cleaned. Remove wheels and bed bar, if possible from the reel. **All bedknives must be ground when reels are sharpened.** Inspect, adjust and/or replace any worn or damaged bearings. Make sure reel bearings are adjusted properly so the reel turns easily by hand.

REELS WITH EXCESS TENSION ON THE BEARINGS WILL BE EXTREMELY DIFFICULT TO SPIN GRIND AND COULD CAUSE DAMAGE TO THE REEL OR THE SPIN DRIVE MECHANISM ON YOUR GRINDER. NO MORE THAN 25 IN LBS. MAXIMUM TORQUE LOAD TO ROTATE THE REEL IS ALLOWED OR DAMAGE TO THE SPIN DRIVE COULD OCCUR.

REELS GROUND WITH BEARINGS WHICH HAVE WEAR AND/OR FREE PLAY WILL NOT HOLD DIAMETER, CYLINDRICAL SHAPE, OR STRAIGHTNESS SPECIFICATIONS.

FIG. 18

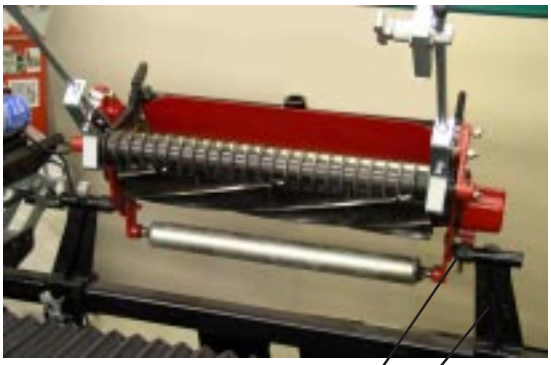


FIG. 19

INITIAL SET UP OF REEL SUPPORTS

A. The preferred method of mounting fairway units and greens mower units is to set the rear roller on the roller supports facing up with the offset either forward or back, depending on mowing unit requirements. Chain clamp around the roller and the tooling bar. See FIG. 18.
B. With greens mowers, you may use the centers mounting brackets. See FIG. 19.
C. On ground drive fairway mowers with exposed hubs, you should use the **OPTIONAL** Pull Gang Reel Mount Kit 18574. Normally they will be positioned in the top two holes of the lower supports with the offset "V" facing the rear of the machine. See FIG. 20.

NOTE: Because of the many different reels available the position of the "V" bracket to the lower support can be adjusted to three different height settings and two offset positions.

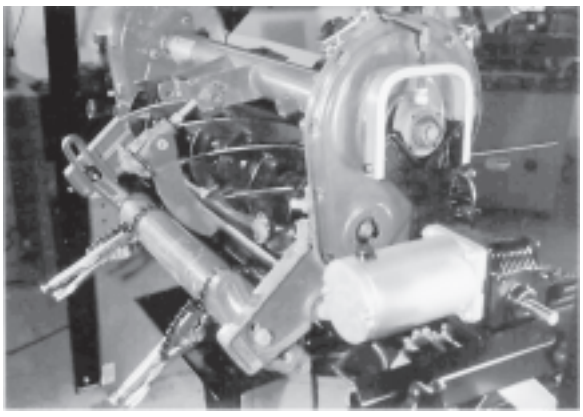


FIG. 20

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRINDING QUALITY.

INITIAL SET UP OF SUPPORTS (Continued)

INITIAL SET UP OF ROLLER SUPPORTS

The roller support brackets should be placed facing up with the V ribs 1 to 2" narrower than the width of the rear roller with the offset either forward or back, depending on mowing unit requirements.

NOTE: Tighten the side locking knob first so the bracket is forced against the mounting bar. Then tighten the bottom bracket. See FIG. 21.

FIG. 21

CENTERS BRACKET SET UP

When mounting greens mower mowing units, centers may be used to hold the mower unit. See FIG. 22. To mount, measure the outside distance of the mower frame. Using the center point of the square mounting bar position the fixed centering bracket 1/2 that distance on the left side and securely fasten. Then place the adjustable centering bracket that distance plus 1/4" on the right side of the mounting bar and loosely fasten. It may be necessary to move this bracket when lifting reel into place even though it can be adjusted. The adjusting cone should be retracted as far as possible as it will be easier to secure reels when in place.

FIG. 22

OPTIONAL PULL GANG BRACKET SET UP

On ground drive mowing units with exposed hubs you will be using the **OPTIONAL** Pull Gang Reel Mount Kit 18574, measure the distance from the outside of the hubs and subtract one inch. Determine the middle of the square mounting bar, by use of the winch cable. Then place a "V" bracket 1/2 that distance on the left side of the mounting bar and securely fasten use both locking knobs.

Now place a "V" bracket on the right side of the mounting bar the same distance from the center point, but loosely attach as it might have to be moved when reel is lifted into place. The roller support brackets should be placed 6 to 8" inside the reel supports with the "V" facing the back of the machine and securely fastened with both locking knobs. The "V's" have an offset so they can be installed high or low depending on the reel. See FIG. 23.

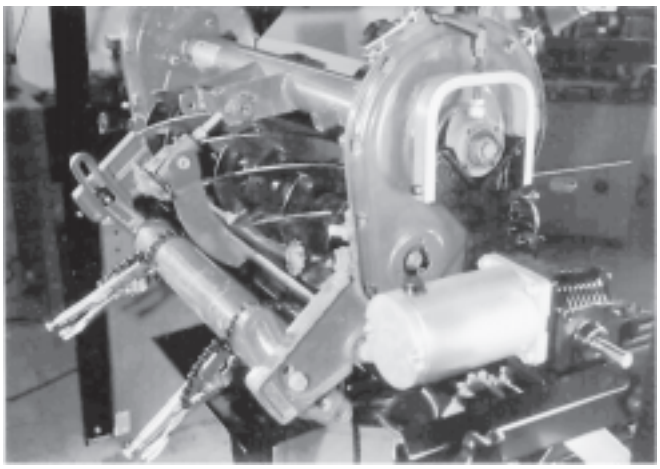


FIG. 23

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRINDING QUALITY.

LIFTING MOWING UNIT INTO POSITION WHEN USING ROLLER SUPPORTS

Position the mowing unit behind the grinder on the floor so the front of the mower faces the front of the machine. Hook the reel elevator spreader bar onto the mowing unit. The hooks on the bar should be spaced evenly along the mowing unit, so they do not slip or slide as it is being raised. See FIG. 24.

FIG. 24

THE OPERATOR SHOULD BE POSITIONED AWAY FROM THE REEL. DO NOT STAND UNDERNEATH THE REEL AS IT IS BEING RAISED. GUIDE REEL AT ARMS LENGTH.

Slowly raise the mowing unit by cranking the winch handle with the right hand and steadying the reel with the left hand. Your left arm should be extended during the lifting operation This will help keep the operator from under the mower.

NOTE: The winch has a spring loaded handle that automatically actuates a brake when the handle is released. The winch clicks as it is being raised when this brake is engaged.

Slowly move the reel into position and carefully lower the cutting unit onto the roller supports. Firmly tighten both locking knobs on the roller supports. Make certain the spin drive can be attached to a drive device on the reel.. Do not connect at this time, just make sure that the connections are close enough to attach at a later time.

When the reel roller is positioned correctly in the roller supports, wrap the chain vise clamp around the roller, and around the square tubing tooling bar. Firmly tighten.

FIG. 25

LIFTING MOWING UNIT INTO POSITION WHEN USING CENTER BRACKETS

Position the mowing unit as described above using roller supports. Slowly raise the mowing unit into position and insert the fixed centering pin into a predetermined hole in the mowing unit frame. While holding the mowing unit firmly against the fixed centering pin, raise or lower the mowing unit so the adjustable centering bracket can be moved and the cone inserted in a corresponding hole in the opposite side of mowing unit frame. Now very firmly tighten both locking knobs on the adjustable bracket and then tighten the adjustable centering pin locking knob. See FIG. 25.

Make certain the spin drive can be attached to a drive device on the reel. Do not connect at this time, just make sure that the connections are close enough to attach at a later time.

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRINDING QUALITY.

THE ADJUSTABLE CENTER MUST BE FIRMLY TIGHTENED INTO THE REEL, BUT EXCESSIVE FORCE CAN DISTORT THE REEL FRAME CAUSING BINDING AND POOR QUALITY.

LIFTING MOWING UNIT INTO POSITION WHEN USING THE OPTIONAL PULL GANG MOUNTING BRACKETS

Position the mowing unit as described on the previous page using roller supports. See FIG. 26

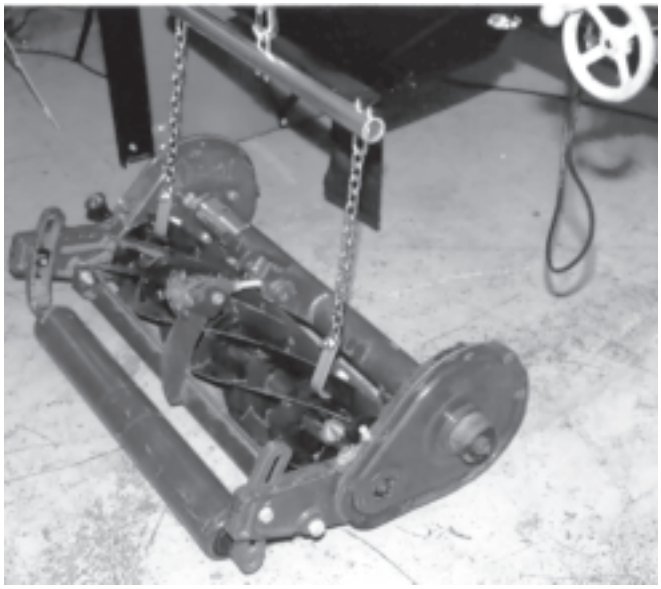


FIG. 26

Slowly raise the mowing unit, when the hub of the reel has been raised above the top of the "V" bracket slowly position the left side of the reel into the bracket and lower until you make contact with the bracket.

Now reposition the right "V" bracket if necessary and lower the reel completely into both brackets. Securely tighten the right bracket using both locking knobs.

NOTE: On reels that have a square or hexagon shaped hub make sure that the surface of the hub is against the flat machined surface of the "V" bracket.

When the reel is correctly positioned in the V-bracket, swing the clamping handles into place and firmly lock in place. See FIG. 27.

NOTE: The clamping handles have two mounting positions for large and small hubs.

NOTE: Unless the elevator hooks interfere with the reels ability to spin, leave the elevator hooks and spreader connected to the reel with slight tension on the wire cable.

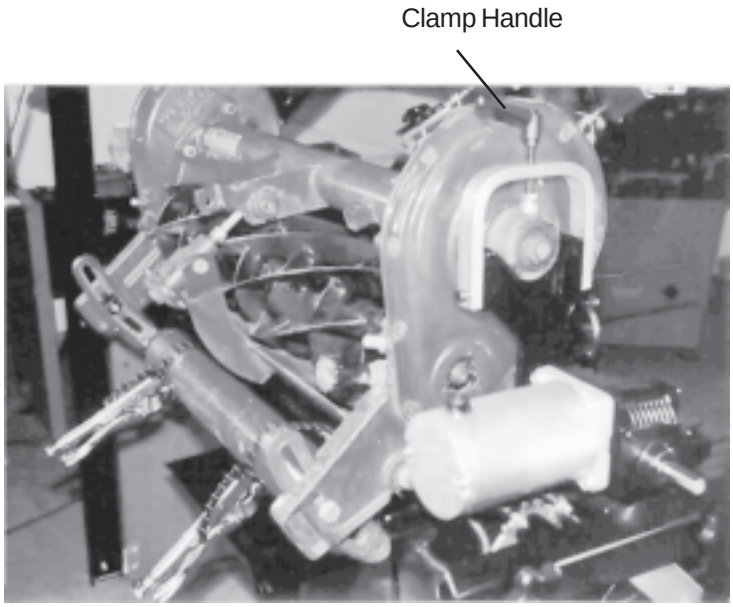


FIG. 27

LIFTING MOWING UNIT INTO POSITION WHEN USING THE OPTIONAL PULL GANG MOUNTING BRACKETS (CONTINUED)

There are two (2) roller supports that are mounted to the square mounting bar so that the "V" faces the back of the machine as pictured in FIG. 28A.

There are four (4) **OPTIONAL** long set screws on these brackets which are used to hold the **OPTIONAL** extender plates when it is necessary to move mower roller back further to help expose the drive nut in the reel. These set screws will also be used to attach the chain vise clamp when reels are in position.

Position the roller supports so the reel roller is centered on the two (2) supports and firmly lock in place.

NOTE: On some reels the "V" grooves of the roller supports will be positioned on top of the support bar. This application is used primarily for fairway and greens mowers. See FIG. 28B.

If extender plates are necessary to move mowing unit back further, simply pull the mowing unit back out of the way and slide extender plate onto both long socket head set screws and tighten down with 3/8-16 nuts and 3/8 lockwashers. See FIG. 28C.

MAKE SURE THAT THE ELEVATOR CABLE IS ATTACHED TO THE REEL AND THAT SOME TENSION IS ON CABLE BEFORE PULLING REEL BACK.

When the reel roller is positioned correctly in the roller brace, wrap the chain vise clamp around the roller, and around the stud on the roller brace. Firmly tighten. See FIG. 29.

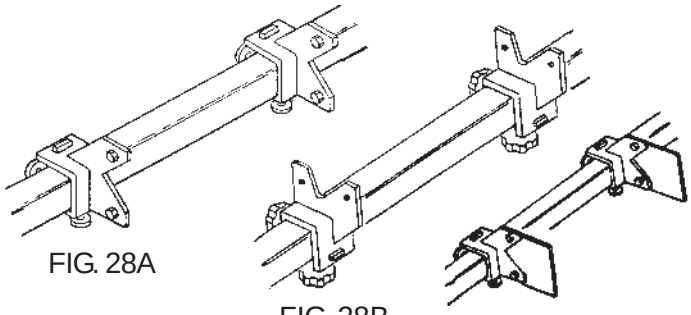


FIG. 28A FIG. 28B FIG. 28C

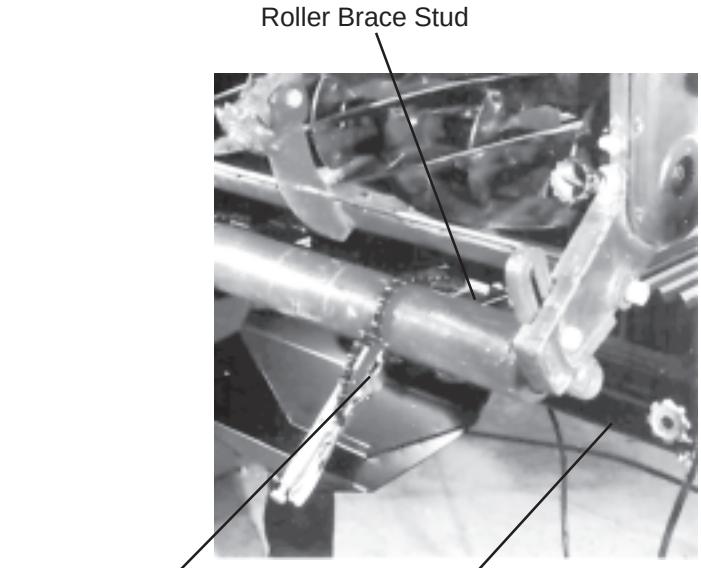


FIG. 29

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRINDING QUALITY.

ATTACHING THE OVERHEAD CLAMPING ARMS

Your grinder is supplied with two clamp rods and two sizes of clamp lips.

Determine which clamp lips to use in your grinding application. You have three choices; First, the large lip clamps which are primarily attached to the front rollers. Second, the small lip clamps are primarily attached to a mowing unit cross bar or a mounting lug or bolt. Third, you can remove the clamping lips, turn the clamp rods 90 degrees and attach the clamp rods directly to the mowing unit using the hole on the end of the clamp rod attached to a stud or bolt on the mowing unit frame.

Loosen the two (2) screw handles on each overhead clamp and move them to where the overhead clamp rods with or without clamping lips can be attached to the mowing unit. Tighten the clamping lips to the mower, then securely tighten the two (2) locking handles on each overhead clamp. See FIG. 30 and FIG. 31.

The overhead clamps can be mounted with the clamping rod above the tubing cross bar as shown in FIG. 31 or they can be mounted with the clamp rod under the tubing cross bar as shown in FIG. 30. It is recommended to mount them under the tubing cross bar whenever possible.

Before tightening the overhead clamps you must correctly position the mowing unit. When using the roller supports or the centers, you can pivot the cutting unit with the overhead clamps. With the relief grinding wheel and the relief guard with fingers installed, you must pivot the cutting unit so you have clearance of the relief finger to the frame, clearance of the next blade to be relieved to the grinding wheel and clearance of the grinding wheel to the front roller.

DO NOT TIGHTEN THE LEFT HAND SLIDE ROD CLAMP WHERE RODS ARE INSERTED INTO THE LOWER PART OF THE CLAMP UNTIL REEL HAS BEEN ALIGNED SEE FIG. 32.

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRINDING QUALITY.

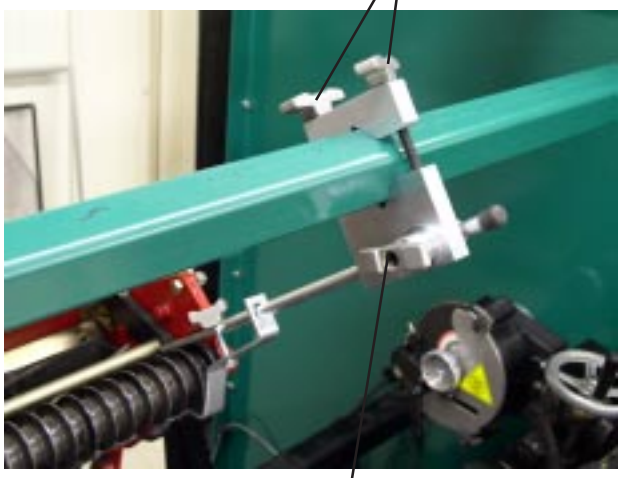


FIG. 30

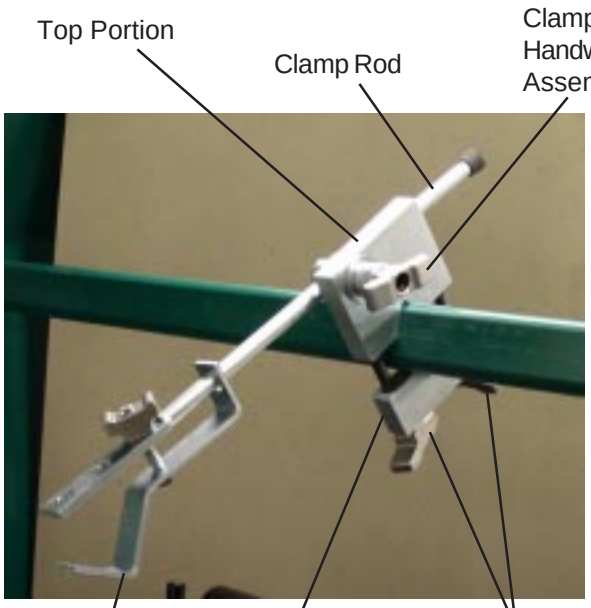


FIG. 31

FIG. 32

ATTACHING THE VARIABLE SPEED SPIN DRIVE UNIT TO THE REEL

When spin grinding, the reel should turn in the same direction as the grinding wheel. See FIG. 33. The normal position for the spin drive unit is on the right side of the square mounting bar when viewing from the mowing unit loading position.

Before positioning the spin drive unit, familiarize yourself with the available adjustments and coupler/ drive assemblies.

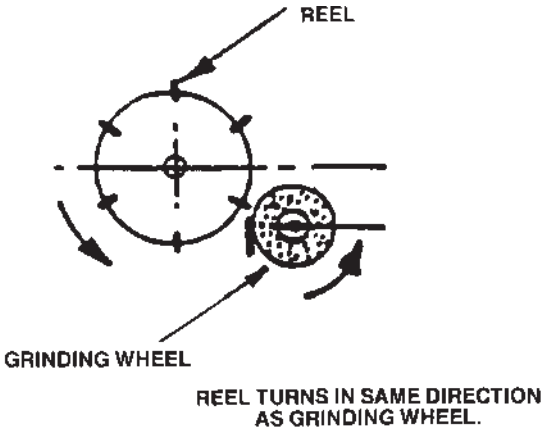


FIG. 33

KNOB A--
Adjusts the scissor bar to move the unit up and down.
KNOB B (2 EACH)--
Allows the spin unit to be loosened and moved in and out.
KNOB C & D--
Allow the spin assembly to be loosened from the support bar frame and moved side to side.

When positioning the spin unit it will be necessary to complete several of the above adjustments to properly align the spin unit to the reel.

34a. Rubber Sleeve Coupler: This is placed in the corresponding flange coupler already mounted in the spin drive shaft.
34b. Drive Coupler Assembly: This is mounted to the rubber coupler.
34c. Adapter Sleeve: Connects the rubber coupler to the square drive adapter.
34d. Square Drive Adapter: This is inserted into the drive coupler adapter and should be able to be moved approximately 2". It will be necessary to move this when attaching reel to spin drive unit. It is then inserted into any 1/2" square drive socket. This square shaft has a groove machined into it on the opposite end of the snap ring. This groove is there to advise that you have reached the maximum extension of the square drive shaft. If you cannot connect to the reel without extending past this groove, then the spin unit must be repositioned on the tooling bar or the longer square drive shaft that is supplied with the grinder can be used.

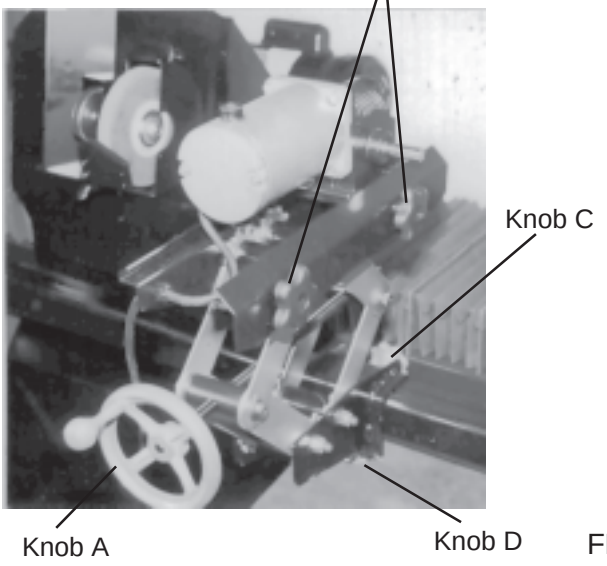


FIG. 34

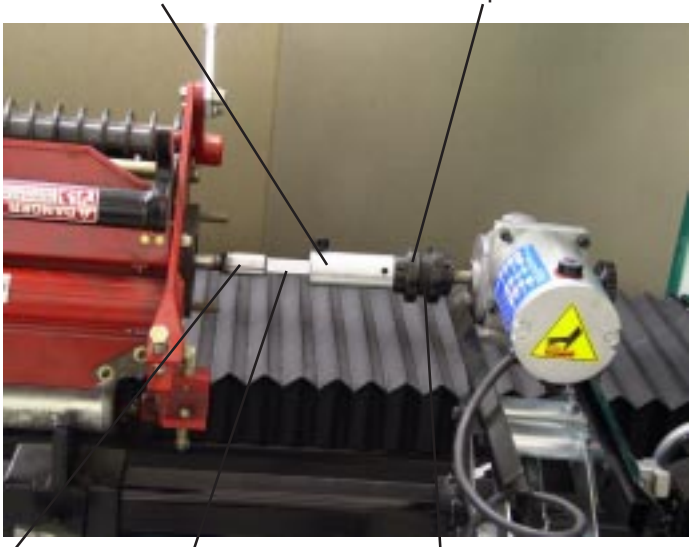


FIG. 35

DO NOT EXTEND SQUARE SHAFT PAST GROOVE, INSTEAD REPOSITION SPIN UNIT.

OPERATING INSTRUCTIONS (Continued)

NOTE: The 1/2" square drive socket that is places on the reel when spin grinding is NOT included with the grinder. You must purchase this from an appropriate local supplier of tools. Many of today's reels have a spline at the end of the reel shaft to receive the hydraulic motor shaft. The cutting unit manufacturer has adapters you can purchase to drive these reels.

The following procedures will make setting up the spin drive unit easier.

1. Move spin drive unit close to the reel. Align the shaft on the spin drive with the drive component on reel by completing the necessary adjustments discussed on the previous page.
2. Now slide the spin drive unit approximately 7" from the reel drive coupling point and securely fasten to the square mounting bar tightening both locking knobs.
3. Place the proper 1/2" square drive socket or adapter on the reel drive component and then insert the square drive shaft into the socket. Place the adapter sleeve over the drive shaft and insert the drive coupler adapter assembly into it. Finally place the rubber coupler onto the drive coupler adapter. See FIG. 36.
4. By holding the square drive shaft firmly into position with your left hand you will be able to move the other components to the right and insert the rubber coupler into the flange on the spin drive unit. When this is done tighten the Tee Knob on the adapter sleeve to hold all parts in place. See FIG. 37.
5. Finally readjust the spin drive unit if it is not in alignment.

NOTE: It is not necessary to have perfect alignment but it must be close enough so that the coupler remains engaged and that excess torque is not applied to the reel.

When intalling large reels into the grinder there may not be room to install the full spin drive adapter assembly. The Spin Drive Adapter Assembly has been designed so that you can remove the 6009051 Square Drive Adapter and the 6009052 Adapter by loosening the two 1/4-20 Knobs. This will expose the square end of 6009217 Drive Coupler Adapter. This can then be short coupled to the reel. See FIG. 38.

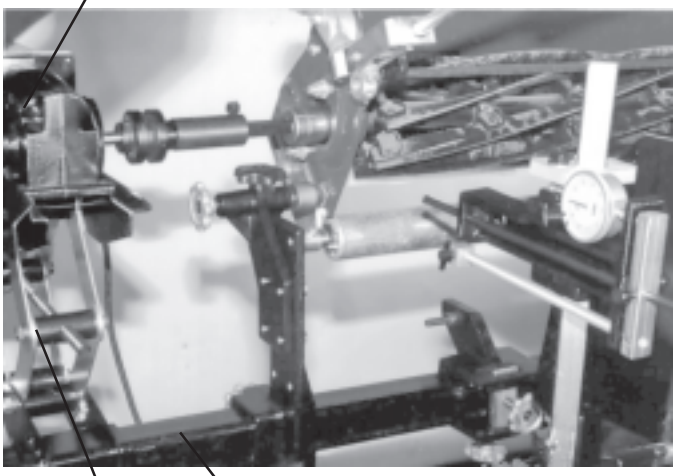


FIG. 36

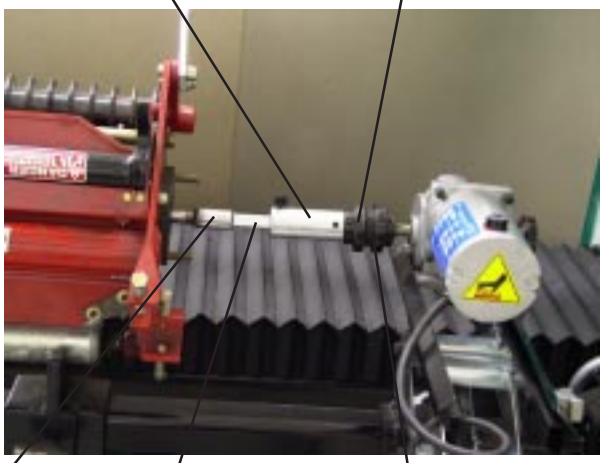


FIG. 37

FIG. 38

SPREADER BAR ASSEMBLY

In most cases, it is recommended to leave the spreader bar and chains hooked up to the mowing unit as an added safety precaution. The cable should be winch tight to insure the chain, hook and spreader bar will not become engaged with the reel during sharpening.

FIG. 39

REMOVING SPREADER BAR FROM REEL

If the hooks will not clear the spinning reel, then remove the spreader bar and hooks from the mowing unit. Place hooks over the top channel on the boom and crank up excessive slack.
See FIG. 39.

DIAL INDICATOR SET UP FIXTURE

The dial indicator set up fixture is designed to be quickly mounted into position and/or quickly removed.

The fixture is mounted to the front left corner of the grinding head assembly as shown in FIG. 40.

When the fixture is not in use, it is quickly removed and stored.

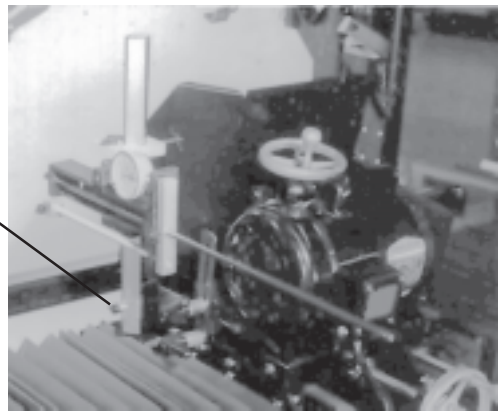


FIG. 40

REEL ALIGNMENT USING THE DIAL INDICATOR SET UP GAGE ASSEMBLY

A. Mount the set up gage into position on the left front side of the grinding head assembly. The gage assembly can be set on the roll pin on the grinding head slide base. This will line up the tee knob with the threaded hole in the casting for an easy install. See FIG. 40.

B. The left side over head clamp rod adjusting knob (See FIG. 41.) must be loose to allow the mower assembly which is mounted on the mower support bar to move freely when doing horizontal and vertical adjustments.

The overhead clamp rods will generally be used as described below:

1. If the mowing unit is mounted with the ground roller clamped to the roller supports with the chain vice clamp, because the geometry does not offer enough stability or rigidity, the overhead clamp rod on the fixed end (right side in the operator's position) should be kept tight.
2. If the mowing unit is mounted in centers and only being stabilized by the overhead clamp rods, then the clamp rod on the fixed end must be kept tight.
3. If the mowing unit is clamped in the **OPTIONAL** Pull Gang Reel Mount Kit 18574 V-brackets and the ground roller is clamped with chain vice clamp, then both overhead clamp rod adjusting knobs can be loose.

C. Loosen the two locking knobs on the cross slide assembly on the left side of the square mounting bar so that it can be adjusted in both the vertical and horizontal plane. See FIG. 42.

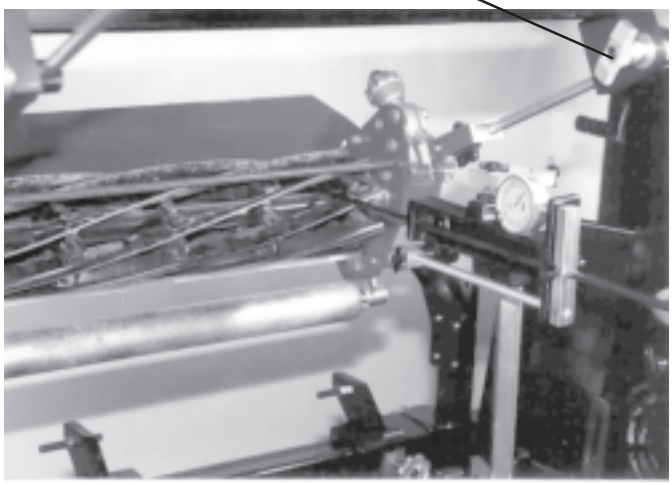


FIG. 41

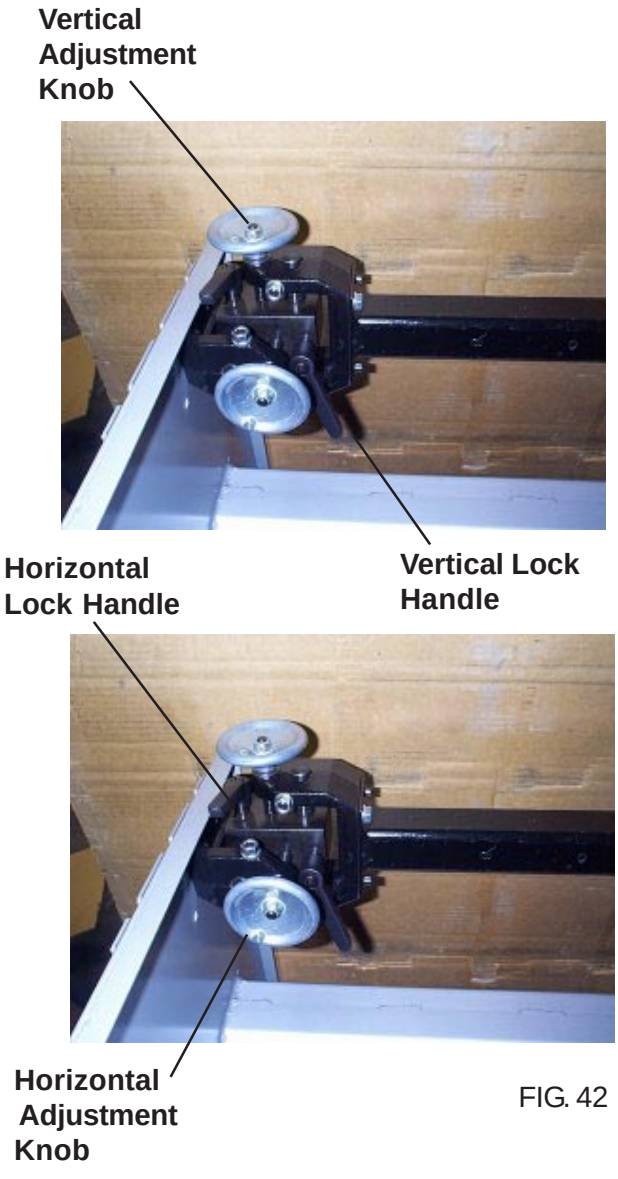


FIG. 42

ALIGNING REELS IN THE VERTICAL PARALLELISM PLANE

A. Move the grinding head assembly until the set up fixture is approximately 1" from the right side of the reel. Lock the Knob A within approximately 1/8" .125" (3MM) of center shaft of the reel. See FIG. 45.

B. Raise the indicator slide casting on the vertical support so that the indicator rod can be extended over or under the center shaft of the reel. See FIG.43 and 44.

C. Lower the indicator slide by turning the vertical fine adjustment Knob B until the alignment rod lightly touches the top or bottom of the reel center shaft. See FIG. 47.

D. Pull rod back and lock Knob C. See FIG. 45. Traverse to the other side of reel, same distance from end. Loosen Knob C and extend alignment rod.

E. If the left side is lower than the right, turn the vertical adjusting handwheel in the cross slide assembly clockwise raising the mounting bar and the reel until the center shaft of the reel lightly touches the extended indicator rod. See FIG. 35.

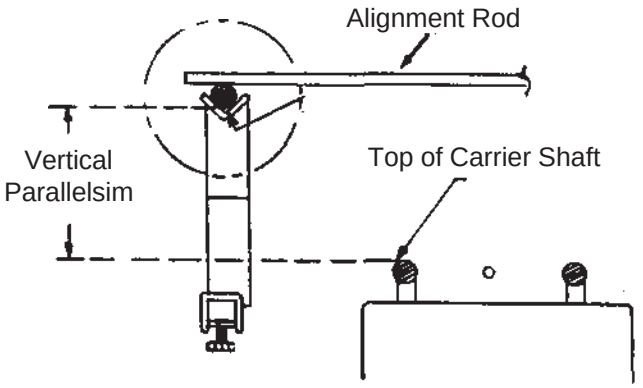


FIG. 43

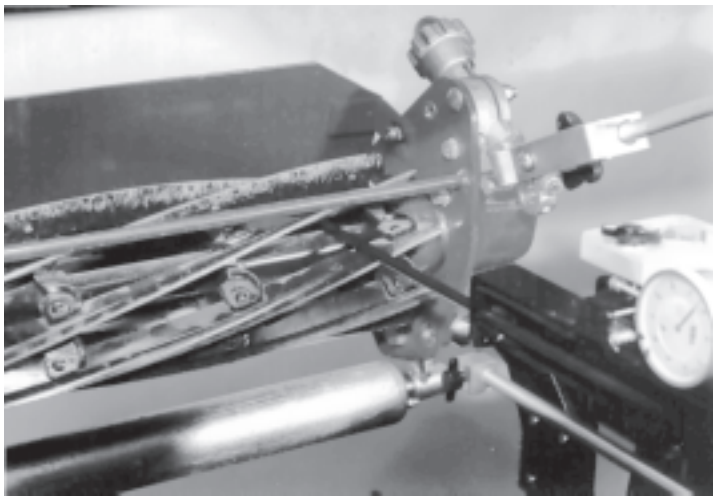


FIG. 44

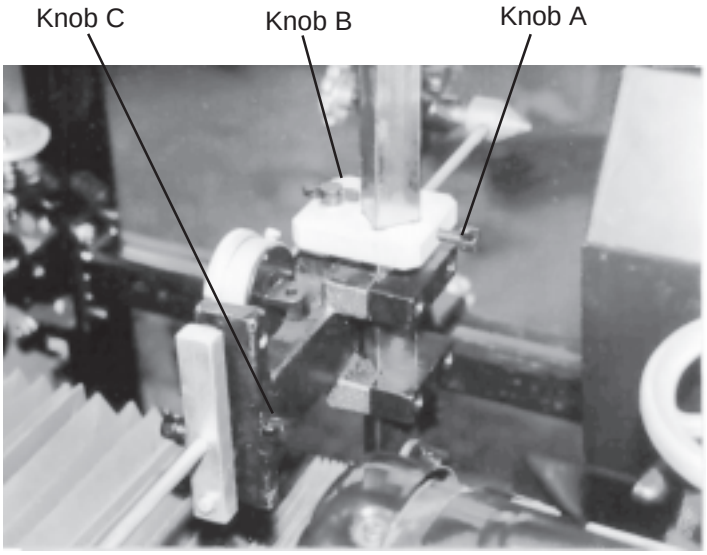


FIG. 45

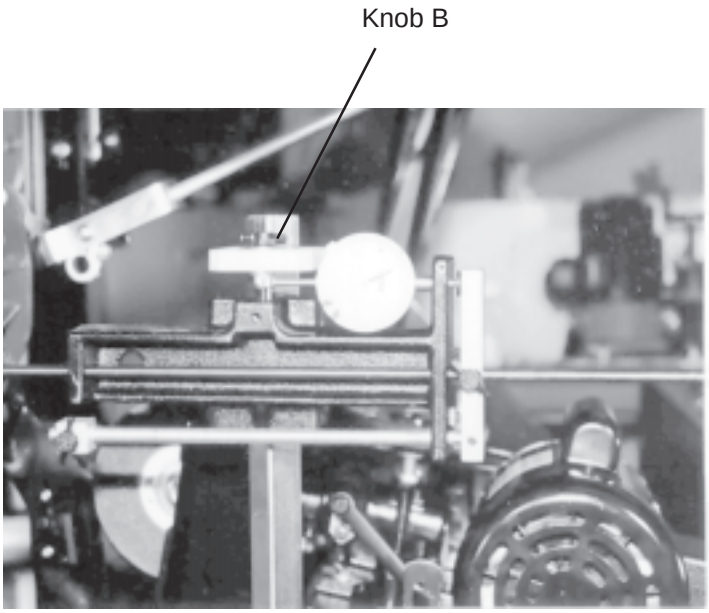


FIG. 47

VERTICAL ALIGNMENT (Continued)

F. Take note of the vertical adjusting knob so you know from where you are starting. See FIG. 49. Now turn the vertical adjusting handwheel an additional 1/2 revolution. This 1/2 revolution is to compensate for the fact that as you adjust the left side, the right side is also moving at a proportioned amount. This should almost align your reel in the vertical parallelism plane. See FIG. 49.

G. Move the alignment fixture back to the right hand side of the reel and readjust the alignment rod so that it lightly touches the top of reel center shaft.

H. Move is back to the left side to make sure the reel is in correct vertical position. If not, move vertical adjustment handwheel up or down so that it just touches alignment rod on both sides. When it does, retest right and left sides until the same.

I. If the left side of the reel is found to be higher than the right, lower the mounting bar and reel until alignment rod lightly touches the top of the reel center shaft and then turn the vertical adjusting handwheel an additional 1/2 revolution. This 1/2 revolution is to compensate for the fact that as you adjust the left side, the right side is also moving at a proportioned amount. This should line the reel up accurately on both sides. Then continue with procedures found in "G" and "H" above.

J. Now lock the vertical adjusting screw locking handle. See FIG. 49.

NOTE: This alignment is not as critical as the horizontal plane, but care should be taken on all reel set ups. The accuracy should be within approximately .010".

NOTE: The pivot end of the support bar is pinned to the frame permanently. The adjustable end can be adjusted independently both vertically and horizontally.

CAREFULLY REVIEW THE CORRECT IDENTIFICATION OF THE LOCKING KNOBS IN FIG. 49. MAKE CERTAIN YOU ARE LOCKING AND UNLOCKING THE CORRECT KNOBS.

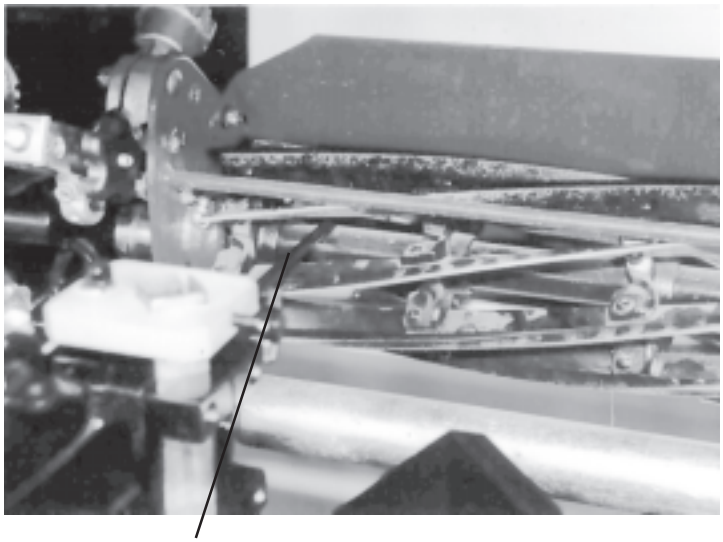


FIG. 48

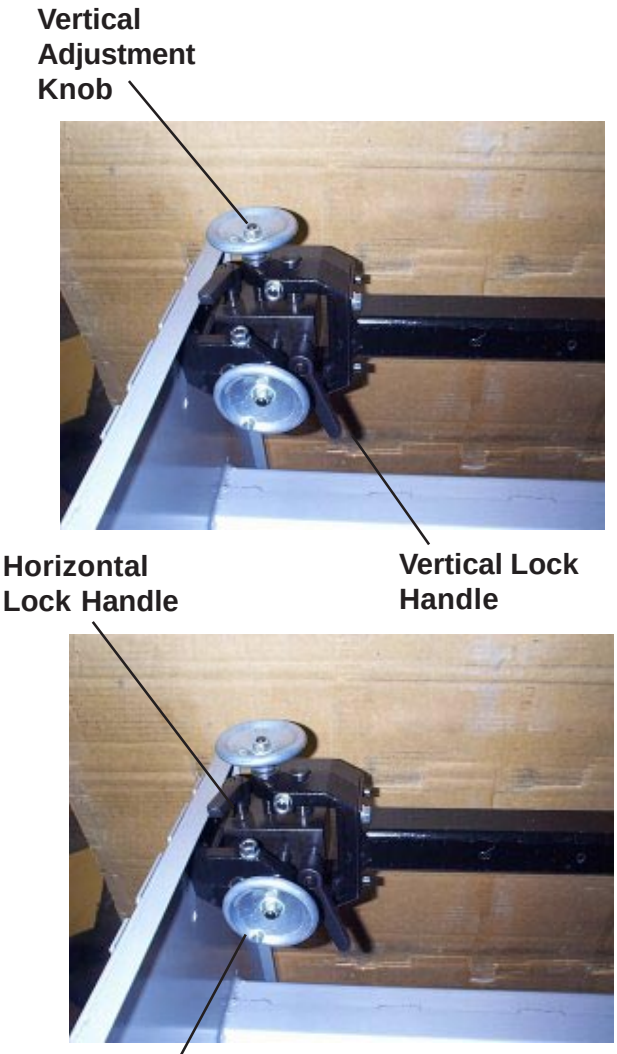


FIG. 49

OPERATING INSTRUCTIONS (Continued)

ALIGNING REELS IN THE HORIZONTAL PARALLELISM

THIS IS A CRITICAL SET UP AND CARE SHOULD BE TAKEN WHEN MAKING THESE ADJUSTMENTS. IF REEL IS OUT OF POSITION IN THE HORIZONTAL PLANE, IT WILL BE GROUND CONE SHAPED. SEE FIG. 56.

A. Move set up gauge on the right hand side of reel approximately 1" from the end. See FIG. 51.
B. Lower the indicator slide casting on the vertical support so the indicator rod can make contact with the center of the reel shaft within approximately 1/16" .062" (1.5 MM) and lock Knob A. See FIG. 45. Center shaft should be clean and free of rust where rod makes contact. Now fine adjust using Knob B until at the center of the center shaft of the reel. See FIG. 51.
C. Now loosen Knob D on the indicator stop bar. Holding the indicator rod firmly against the reel shaft, move the indicator stop bar back, until no contact is made with the indicator rod plunger. Now move indicator stop bar forward until contact is made and then an additional 1/2". This will set the plunger at about its midpoint and allowing it to move in both directions. See FIG. 53.
D. Now set the outer dial indicator to the "0" position. Read and note the position of the smaller (.100) dial. You must know this reading when setting up the other side. Pull back and lock with Knob C. See FIG. 45.
E. Move the alignment gauge to the left side of the reel carefully retracting the indicator rod so as not to damage or change setting. Set indicator rod on the same position on the reel as you had on the right side, that is 1" from the end and centered on the shaft. See FIG. 52. Now read the dial indicator to determine the distance the reel is out of position.

NOTE: Because the set up gauge is mounted to the carriage, you can unlock the actuator drive system and traverse manually from end to end.

When you pull the indictor rod back, there is a wing screw ("C") to snug up so you do not have to hold the rod in the back position.

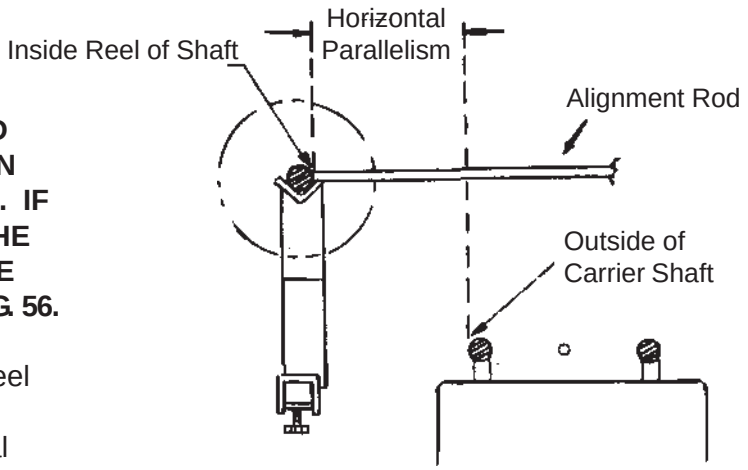


FIG. 50

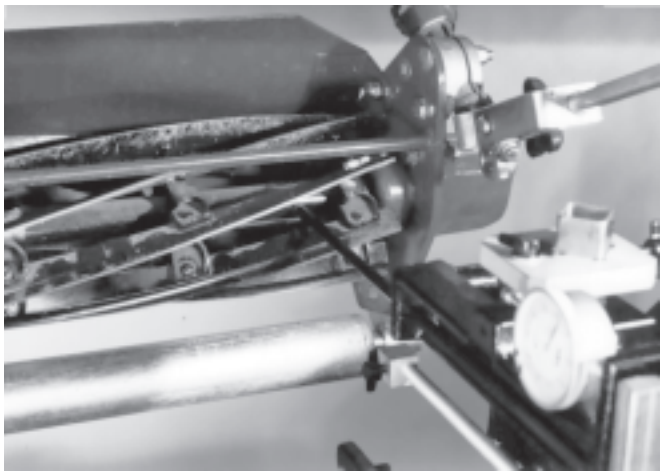


FIG. 51

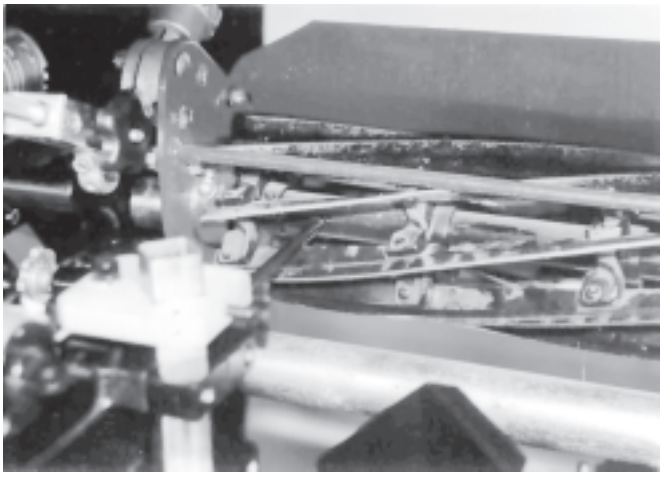


FIG. 52

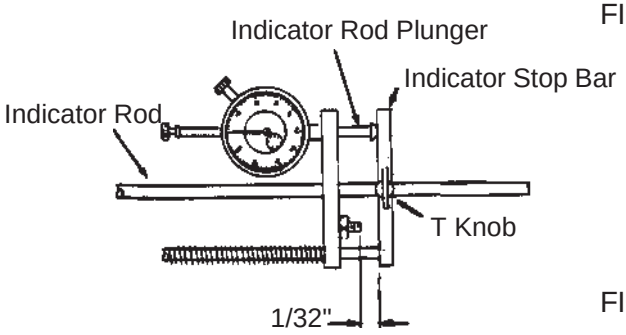


FIG. 53

ALIGNING REELS IN THE HORIZONTAL PARALLELISM (Continued)

F. To adjust reel position first determine the direction the reel has to move for alignment. The direction that the reel will have to be moved can be determined by pulling back on the dial indicator stop bar and if the dial moves back to the "0" position you will have to move the reel towards you. If that cannot be done the reel will have to be moved away from you.

There are two adjusting steps for final positioning of the reel as follows:

1. With the reel set gauge still in the left hand side of the reel, turn the horizontal adjusting handwheel (FIG. 49) in the direction required to match the initial indicator reading on the right hand reel position. See FIG. 51.
2. Now travel farther by half the amount already traveled.

The reason for this is that the square mounting bar pivots on one end and is adjusted on the opposite end. Anytime the adjusting end is moved to change the left side dimension, the right side dimension is also changing at a ratio to the left side. By over compensating at the adjusting end you will compensate for this movement and get the reel aligned much faster.

G. Now move the set up stand back to the right side of the reel. Set indicator rod on the same spot you used the first time and reset large dial on "0". Make sure you read the setting on the small scale and note. Then proceed with paragraph "E" & "F" again. This should give final adjustment. When you have done this procedure a few times you will find this procedure will become very easy.

IT IS ESSENTIAL THAT CARE IS TAKEN WHEN SETTING THE REEL UP IN THE HORIZONTAL POSITIONS IN ORDER TO GRIND IT INTO A CYLINDER SHAPE. ANY MISALIGNMENT WILL CAUSE YOU TO GRIND INTO A CONE. SEE FIG. 56.

H. When the horizontal parallelism has been adjusted to within .003" (.076 MM) end to end, tighten the horizontal adjustment locking handle. See FIG. 54 and both overhead clamp adjusting knobs. See FIG. 55. When tightening the knob it is very important that you have the dial indicator located at that side of the reel and watch it as you tighten. It must not move in the tightening process. After both knobs are tight, recheck alignment.

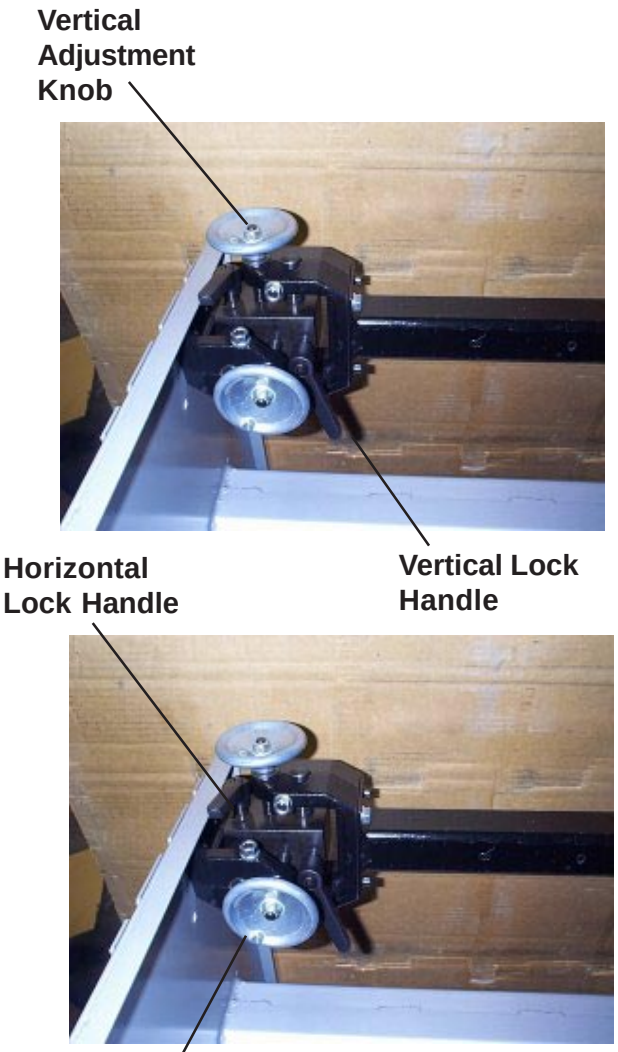


FIG. 54

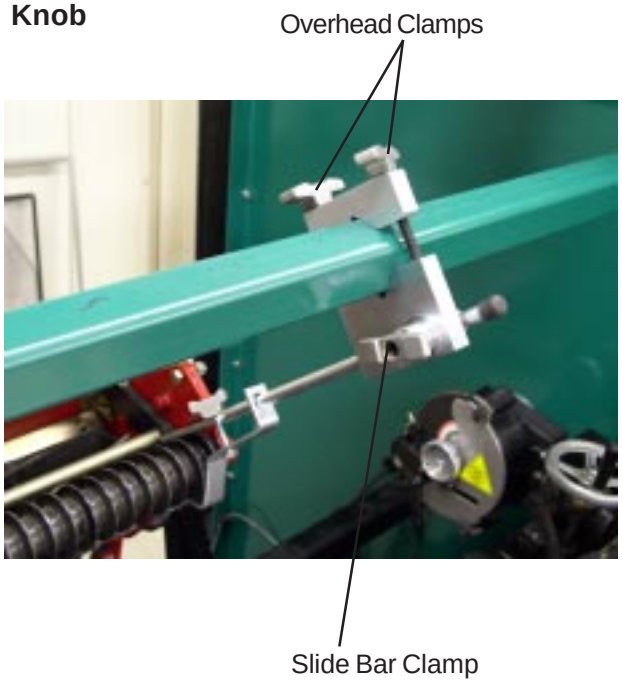


FIG. 55

CHECKING REEL FOR CONE SHAPE, REEL ROUNDNESS, AND STRAIGHTNESS OF REEL OUTSIDE DIAMETER.

BEFORE GRINDING--

A. Before storing the set up gauge, it is very effective to use it to check the ungrounded reel to determine the amount the reel is conical in shape and which end has the larger diameter. See FIG. 56. Start with the set up gauge at the right end of the reel. Loosen the knob on the indicator stop bar, holding the indicator rod firmly against one blade. See FIG. 53. Pull the indicator stop bar back until it clears the plunger then advance it forward until it contacts the plunger and advances it 1/2 inch further. Lock in place. This sets the plunger at its midpoint and allows adequate movement in both directions. Set outer dial at zero and note position of pointer on small dial.

B. Now move it to the left side of reel and indicate the same blade. From the reading determine the amount the reel is cone shaped. This also determines high point for grinding. Grinding of a reel must always start at the high point.

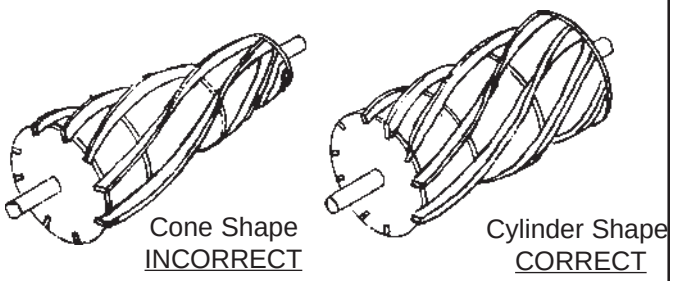


FIG. 56

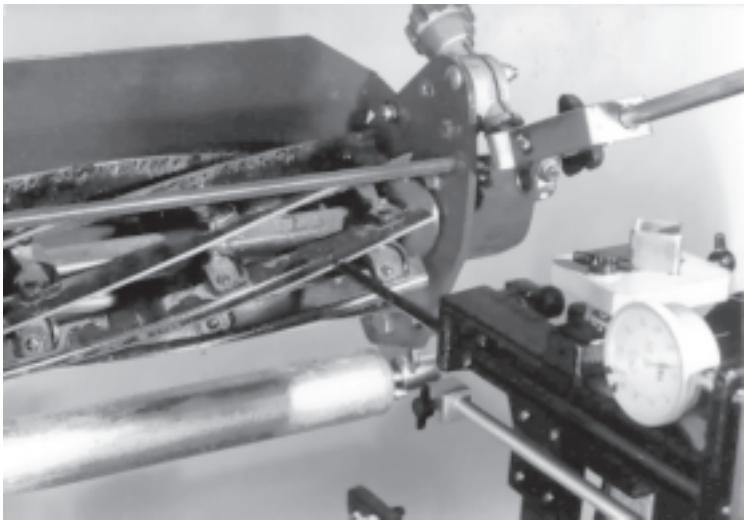


FIG. 57

AFTER GRINDING--

A. After grinding a reel, check the roundness on each end of the reel and center before removing ground reel. See FIG. 57. Loosen the knob on the indicator rod firmly against one blade. Pull the indicator stop bar back until there is a 1/32" gap between it and the set screw. This is to permit rotation of the reel blades to ride on the domed anvil only. See FIG. 58. At each location (left, right and center) turn the reel by hand and observe the indicator variations. All readings should be within .002".

B. Straightness of reel outside diameter--Take indicator readings at both ends of reel. Compare readings between each end of reel for straightness. All reading should be within .002".

C. Carefully remove the setup gage and store it.

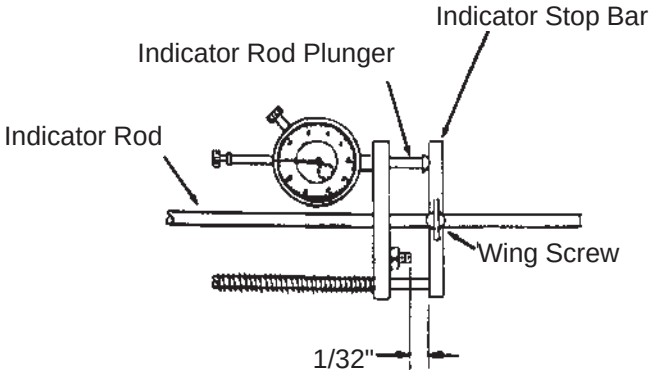


FIG. 58

SETUP PROCEDURE FOR SPIN DRIVE RPM VERSUS TRANSVERSE SPEED

SPIN DRIVE RPM

SPIN DRIVE RPM IS VERY IMPORTANT IN ACHIEVING A QUALITY GRIND. USE CARE IN ESTABLISHING THE SPIN DRIVE RPM, PER THE INSTRUCTIONS BELOW.

Generally, the Spin Drive RPM will be between 180 RPM (45%) and 300 RPM (80%). The speed required to spin a specific reel is dependant on reel diameter, the number of reel blades, and reel hardness. For all reels, there is an optimum Spin Speed where there is an **AGGRESSIVE**, yet smooth grind as you spin grind the reel. Your objective is to spin grind the reel as aggressively and as fast as possible while maintaining top quality.

It is recommended to start grinding each reel at a Spin Speed of 200 RPM (50%) and evaluate the RPM by adjusting higher and lower to optimize the Spin Speed for that reel. If the Spin Speed is incorrectly set, you can experience two problems, grinding wheel dressing or grinding wheel resonance. Each of these problems is explained below.

On some reels, especially small diameter high blade count reels if the Spin Speed RPM is set to high, the reel can act as a dresser to the grinding wheel. There can develop what appears to be a very aggressive grind (as if the infeed has self infed) and then a sudden stop of grinding with no grinding wheel to reel contact. If this occurs, your Spin Speed was set to high and you effectively dressed your grinding wheel.

Some reels have a resonant RPM where the reel goes into harmonics with the grinding wheel and the resonance vibrates the grinder and results in a very bad grind. By changing the Spin Speed to a higher or lower RPM you will move out of the resonant range.

After determining the best Spin Speed RPM for a reel, note the RPM on a "Setup Chart" that you will make. By noting the correct RPM, you will avoid evaluating the Spin Speed the next time you grind the reel.

TRAVERSE DRIVE RPM

The Traverse Speed potentiometer is adjustable from approximately 5 feet per minute [1.5 meters per minute] to 35 feet per minute [11 meters per minute]. It is recommended to grind between 15 and 20 feet per minute [4 and 6 meters per minute].

Grinding at a slower traverse speed, 10 feet per minute [3 meters per minute] as an example, will give a better finish but will extend the grind cycle time. Grind finish versus grind cycle time is controlled by the choice of the operator.

GRINDING REEL INTO A TRUE CYLINDER BY SPIN GRINDING

This grinder is equiped with two grinding wheels and two grinding wheel guards. Prior to spin grinding install or verify installation of the 1" (25 MM) wide grinding wheel and the spin wheel guard which has no fingers attached. See FIG. 59

A. Before you proceed any further, check all knobs to insure they are tight.

FIRMLY TIGHTEN ALL LOCKING KNOBS BEFORE GRINDING. ANY LOOSENESS WILL ADVERSELY AFFECT GRIND QUALITY.

B. There are three (3) lock handles for locking the grinding wheel vertically. Two (2) on the base for the adjusting arm locks and one for grinding wheel vertical height adjustment locking screw. See FIG. 60.

C. Position the height of the grinding wheel center so that it is 0 to 1" below the reel center. See FIG. 61.

D. Infeed the grinding wheel until it just makes contact with a reel blade while rotating the reel by hand. Now tighten the two locking knobs on the locking arms and the locking knob for the height adjustment screw. Back the grinding wheel off so it just clears the reel.

FIG. 59

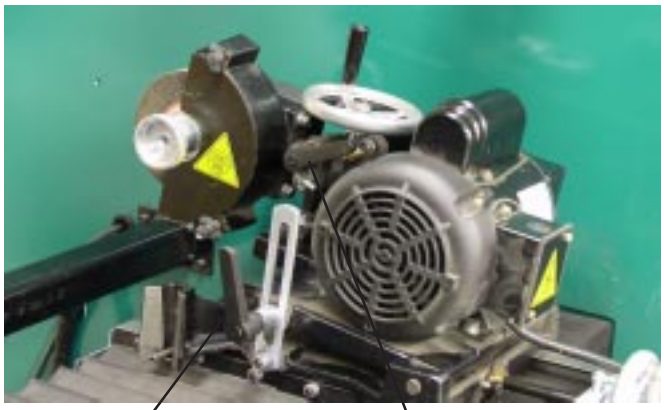


FIG. 60

Lock Handle Adjusting Arms (1) each side

Lock Handle Vertical Adjustment Lock

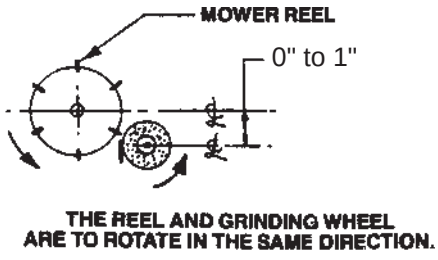


FIG. 61

GRINDING REEL INTO A TRUE CYLINDER BY SPIN GRINDING (Continued)

E. Move the grinding wheel back from the reel and frame so it will clear at all points. Set proximity switches so they line up approximately with the end of the frame and tighten them securely. See FIG. 62 & 63. Adjust the traverse speed knob to zero and turn traverse switch to on. Increases the traverse speed knob so the carriage will traverse slowly across the reel.

FIG. 62

When the carriage has come to a momentary stop against proximity switch, turn traverse switch off. In this position, check to see that grinding wheel has cleared the end of the reel. If not, readjust stop so the reel clears the end of the reel.

CAUTION, IF THE REEL FRAME EXTENDS BELOW THE REEL ITSELF, MAKE SURE THE STOP IS SET SO THAT THE GRINDING WHEEL WILL NOT RUN INTO FRAME WHEN GRINDING. IT IS POSSIBLE THAT IN SOME CASES THIS WILL MEAN THE GRINDING WHEEL WILL NOT CLEAR THE END OF THE REEL WHEN GRINDING.

FIG. 63

F. Repeat this procedure for the other side of the reel. Then set the traverse speed dial to "10" and let the carriage traverse back and forth to make sure that the stops are set properly.

G. Move grinding carriage to the high side end of the reel and stop carriage. Put the Grind Selector Switch to Variable Speed Spin.

H. Turn on spin drive motor and check to see if reel is spinning freely and that coupling components are properly aligned.

I. With the spin drive running at 200 RPM, turn on grinding wheel motor on main control panel. Verify that the spin rotation is the same as the grinding wheel, clockwise, looking at the right end of the reel from the operators position. See FIG. 64. Now slowly infeed the grinding wheel until it just make contact with the reel.

FIG. 64

GRINDING REEL INTO A TRUE CYLINDER BY SPIN GRINDING (Continued)

J. Set traverse speed knob to approximately "12", then turn on the traverse switch and begin grinding. If reel is in bad condition, traverse slower as more material can be removed. Conversely, if the reel is in good condition, speed can be increased.

MAXIMUM RECOMMENDED STOCK REMOVABLE PER PASS IS .008. NOTE: THE INFEED HANDLE IS CALIBRATED IN INCREMENTS OF .002 (.05 MM) ON THE RING SCALE LOCATED ON THE INSIDE OF THE INFEED HANDLE.

K. If grinding wheel is only making contact in one part of the reel, adjust the traverse stop so the carriage traverses slightly further than the contacted area. As you infeed and wheel makes full contact in this area, move traverse stop away 3" [7.6 cm] to 5" [12.7 cm]. This will speed up the grinding process of getting a cone shaped reel into a true cylinder. See FIG. 65.

L. Spin grinding is completed when full contact is made across the entire length of the reel and the entire width of all blades and the cutting edge is sharp. It is required to have a sparkout to complete grinding the outside diameter to a true diameter. For sparking out, the process is to infeed the grinding head for approximately .002 (.05 MM) stock removal (one line on the ring scale) and let the grinding wheel sparkout. For sparking out in grinding process, always traverse the grinding head at least 20 passes with no additional infeed. Set traverse at slow speed on dial setting approximately 4 to 8 feet per minute range for final grinding sparkout. After sparkout, shut the grinder completely off.

NOTE: This process refers to sparkout, but what we are looking for is a near sparkout, approximately a 99% reduction in grinding sparks from normal grind. Do not run sparkout until you have no sparks because this could be an extremely extended period.

NOTE: Greatest accuracy and best finish is obtained when reel is sparked out. Use your set up gauge, prior to relief grinding to check the reels for roundness. This is very important when first learning the operation of your machine.

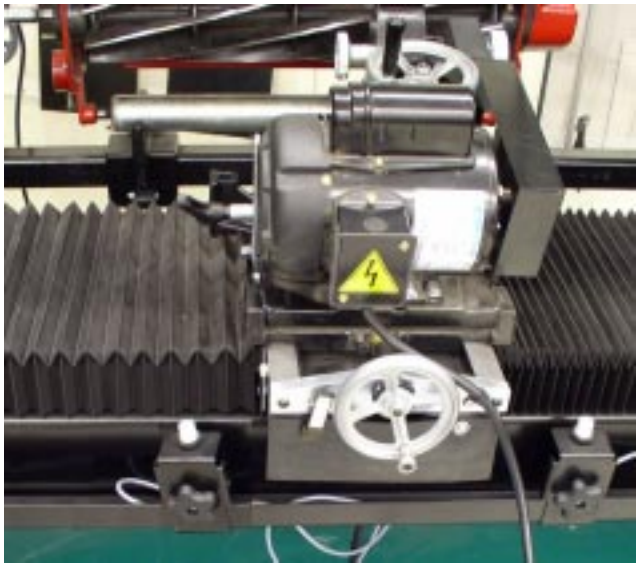


FIG. 65

M. Verify the reel straightness and roundness. Install the alignment gage. Index reel blade until you read the high point on the indicator. Now loosen the knob and set the indicator stop block to a 1/32" gap as shown in FIG. 57 & 58.

Mark this blade as #1 and set the large dial of indicator setting to "0", then check each blade for maximum and minimum reading.

Check each end of reel and at the center. After becoming familiar with the process, you will not have to check each reel.

IT IS VERY IMPORTANT IN SPIN GRINDING THAT YOU THOROUGHLY SPARKOUT AT THE END OF THE GRIND CYCLE. THE DIFFERENCE BETWEEN ACHIEVING .005 OR .003 TOTAL INDICATOR READING IS ACCOMPLISHED THROUGH PROPER SPARKOUT.

REEL SPIRAL OR HELIX

When standing behind the mowing unit when the mowing unit is sitting in normal position on the ground. If the spiral is such that the right side of the blade cuts before the left, it is a right hand lead in or a right hand spiral reel. If the spiral is such that the left side of the blade cuts before the right it is a left hand lead in or left hand spiral reel. Most reels made today are right hand spiral and are referred to as normal helix.

RELIEF GRINDING TO COMPLETE THE REEL GRINDING PROCESS

A. This grinder is equipped with two grinding wheels and two grinding wheel guards. Prior to relief grinding install or verify installation of the 3/8" (9.5 MM) wide grinding wheel and the relief wheel guard which has the relief and index fingers attached. See FIG. 66.

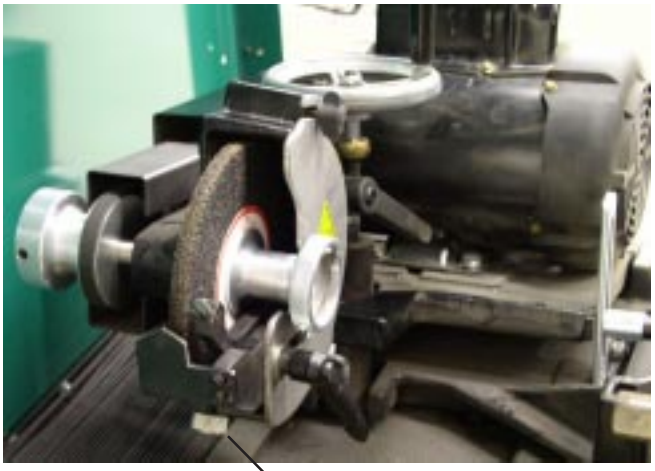


FIG. 66

B. Check to see if your mowing unit is normal or reverse helix.

NOTE:
As you look into the guide finger on **PAGE 35, IT SHOWS THE NORMAL REEL HELIX.** The high point of the relief finger is on the right hand side of the grinding wheel.

As you look into the guide finger on **PAGE 36, IT SHOWS THE REVERSE REEL HELIX.** The high point of the relief finger is on the right hand side of the grinding wheel.

Most mowing units are normal helix.

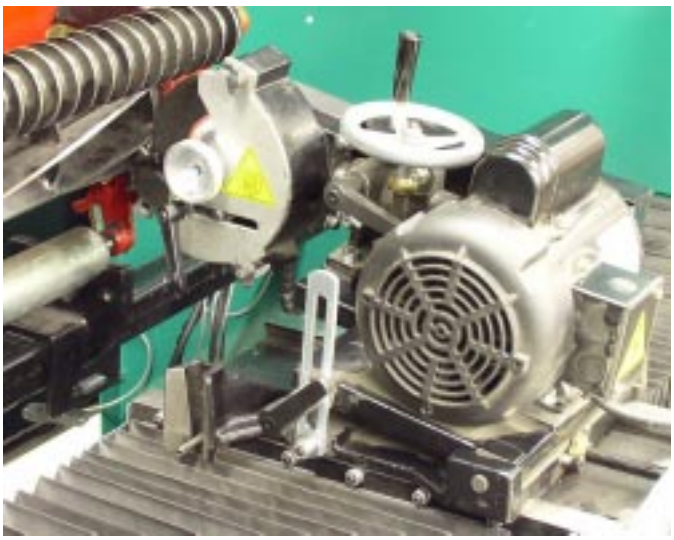


FIG. 67

C. Reset the Traverse Limit Proximity Switch so the grinding wheel clears the reel at both ends by approximately 1/16" (1.5 mm) or the reel blade comes off the relief finger on the right side. See FIG. 69 - 72.

D. Set Grind Selector to variable torque relief.
NOTE: THE SPIN DRIVE ROTATION SWITCH MUST BE IN THE OFF POSITION WHEN CHANGING GRIND SELECTOR SWITCH.
Set Spin Drive Rotation switch to rotate the reel into the stop finger, counterclockwise (CCW) when looking at the right side.

NOTE: Relief torque reel rotation is always opposite spin rotation.

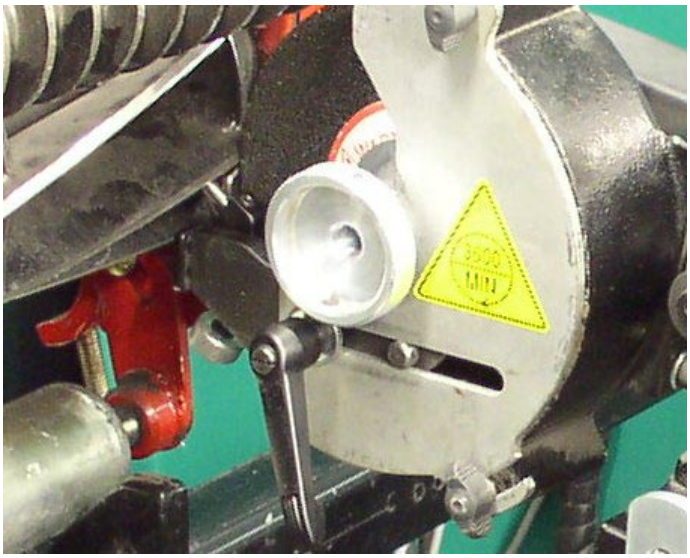


FIG. 68

REEL SPIRAL (Continued)

E. There are three (3) lock handles to loosen. Two (2) on the base for the adjusting arm locks and one for the grinding wheel vertical height adjustment lock. Raise the grinding head up approximately seven (7) turns so the reel blade can rest on the reel guide finger. It will be necessary to infeed the grinding wheel to accomplish this. See FIG. 67.

F. Now you can adjust the back angle you wish to put on the reel blade.
(The average recommended manufacturer's angle is 20 to 40 degrees. When in doubt, check with each reel manufacturer as to the exact angle required.)
By looking down the reel from the operator's position you can see the reel blade and its relative position to the grinding wheel. See FIG. 70. By raising the grinding wheel you will decrease the relief angle and conversely by lowering the grinding wheel you will increase the relief angle. When the relief angle is correct, traverse the grinding wheel assembly to the right side of the reel. Retighten all three (3) lock handles.

G. The Index Finger position must be set to stop the reel blade and allow traversing to the left without the blade hitting the side of the relief finger. This position must also allow approximately 1/32" (1 mm) free play of the index finger when the blade is resting on the high point of the relief finger. See FIG. 68.

H. Turn the traverse speed pot to zero, then turn the traverse drive motor on. Using the speed pot to slowly move and stop the grinding wheel, jog left until the reel blade is on the relief finger.

I. Adjust the grinding head forward until there is minimal clearance between the reel blade and the grinding wheel.

J. Adjust the index finger positioning by rotating the back stop knob on the bottom forward of the grinding head. This position must allow approximately 1/32" (1 mm) free play of the index finger when the blade is resting on the high point of the relief finger.
See FIG. 66 and 68.

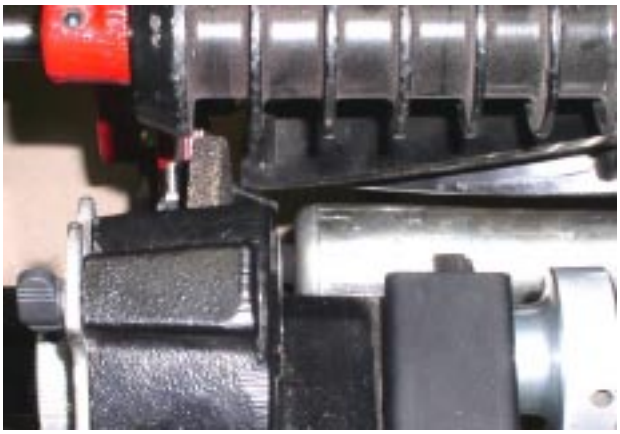


FIG. 69

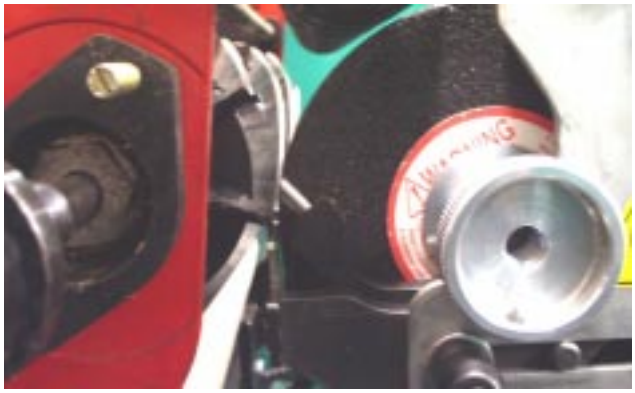


FIG. 70

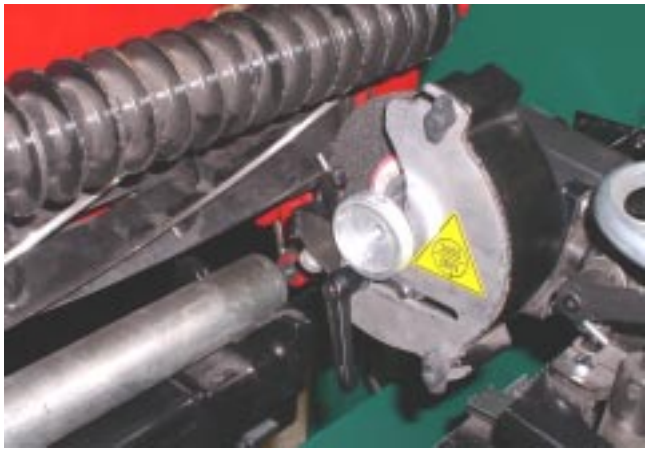
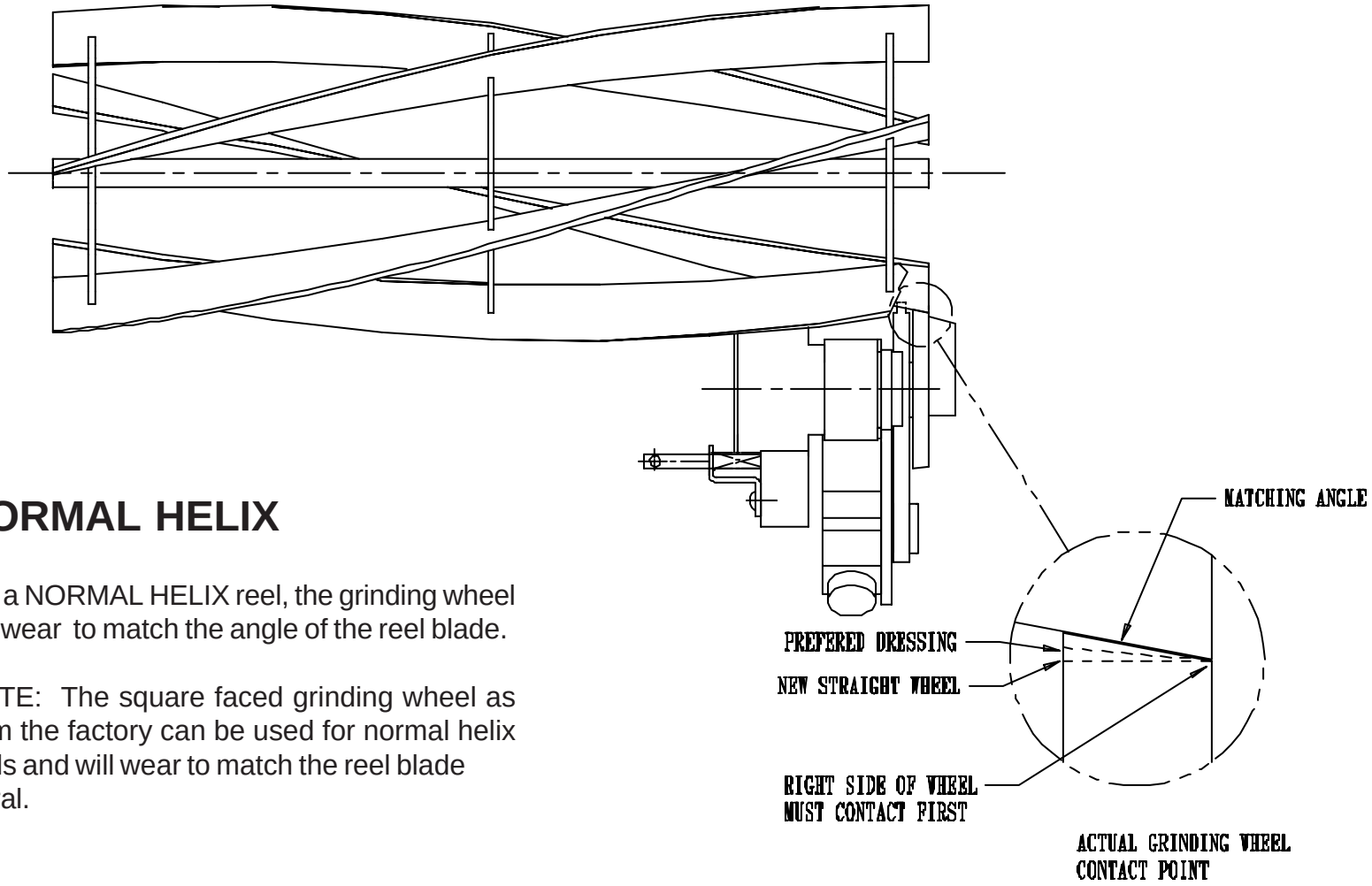


FIG. 71

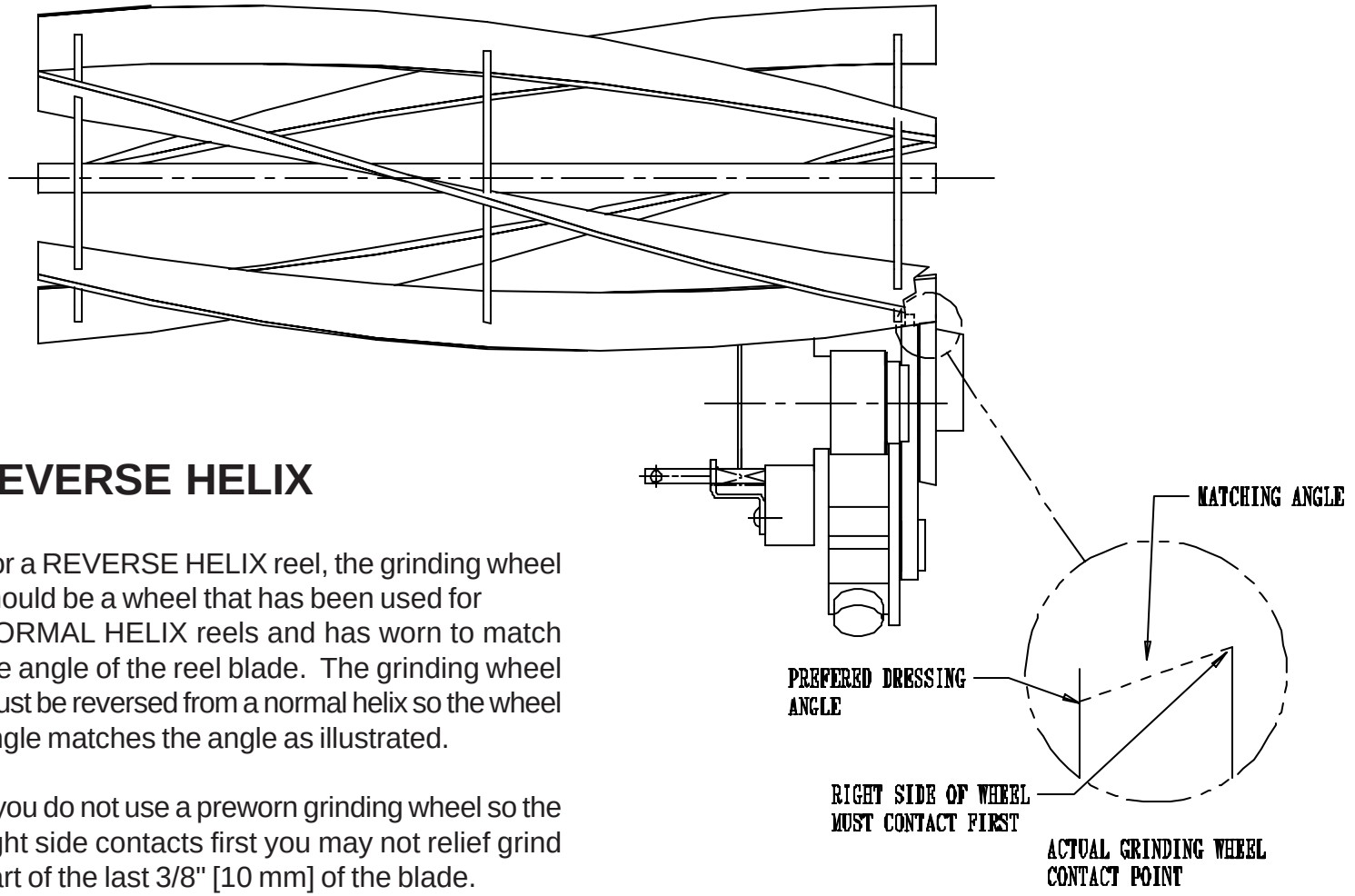
FIG. 72



NORMAL HELIX

For a NORMAL HELIX reel, the grinding wheel will wear to match the angle of the reel blade.

NOTE: The square faced grinding wheel as from the factory can be used for normal helix reels and will wear to match the reel blade spiral.



REVERSE HELIX

For a REVERSE HELIX reel, the grinding wheel should be a wheel that has been used for NORMAL HELIX reels and has worn to match the angle of the reel blade. The grinding wheel must be reversed from a normal helix so the wheel angle matches the angle as illustrated.

If you do not use a preworn grinding wheel so the right side contacts first you may not relief grind part of the last 3/8" [10 mm] of the blade.

NOTE: A wheel that has been worn to match a normal helix can generally be removed and reversed to grinder reverse helix reels.

K. Turn the Torque Potentiometer to zero. Turn the Spin Drive motor on.
NOTE: The spin drive will apply torque load against the fingers. Slowly turn the Relief Torque Potentiometer up to approximately 15.
NOTE: Free turning reels may need a lower value than 15. Stiff reels or reels with a drive train may need a higher torque than 15. Do not exceed 45 on the relief torque potentiometer setting.

L. Jog the traverse all the way to the left prox switch watching for proper clearance between the grinding wheel and the blade. When the grinding head reaches the left prox, the index finger should pop forward. See FIG. 70. The grinding wheel should come off from the reel blade, but the reel blade should remain on the fixed relief finger. See FIG. 69. If not,adjust the left side proximity switch position until correct. Check for proper clearance between the index finger and the front side of the blade on the return trip to the home (right hand prox) position. See FIG. 71. Also verify clearance between the index finger and the reel blade support spiders.

M. Stop the traverse in home position and check for a proper blade index. See FIG. 72. The fixed relief finger should come off the reel blade, the relief torque from the spin drive should rotate the reel so the next blade contacts the index finger and pushes the index finger back against its stop.

The traverse drive control is factory set with a two second dwell time before it reverses the carriage travel. This is to allow time for the reel to rotate and the index finger to catch the next blade. If necessary the dwell time can be adjusted (refer to Control Board Potentiometer Adjustments section on Pages 23 in the Assembly and Service section of this manual).

N. Allow the grinder to traverse down and back to verify everything is properly set up. Turn the traverse potentiometer to zero once the home position is reached.

O. Turn on the Grinding Wheel Motor.

P. Turn on the traverse speed pot to a proper grinding speed. Slowly infeed the grinding wheel until you are able to grind the full length of the reel blade evenly. You can infeed between .005" to .012" at a time. Be sure you have ground all the blades before infeeding further.

NOTE: Traverse speed should be approximately 15 fpm. If you are removing a small amount of stock on initial infeeds, faster traverse speeds are suggested. If you are removing a large amount of stock on later infeeds, slower traverse speed may be required.

WHEN YOU HAVE SUCCESSFULLY COMPLETED THE SPIN GRIND AND RELIEF GRIND ON A GIVEN MOWING UNIT TYPE, THEN MEASURE AND COMPLETE THE SETUP CHART ON PAGE 38.

REEL SETUP CHART

Note: These dimensions will vary due to reel position in frame, reel dia., height of cut, roller position, etc. Use these values as a guide only.

REEL MAKE, MODEL & HEIGHT OF CUT	REAR TOOLING MOUNT TYPE	REAR TOOLING MOUNT POSITION	OVERHEAD CLAMP MOUNT TYPE	OVERHEAD CLAMP MOUNT POSITION	OVERHEAD CLAMP ROD DISTANCE	SPIN DRIVE POSITION	SPIN SPEED SETTING	SPIN TORQUE SETTING	TRAVERSE SPEED SETTING	NOTES

SKILL AND TRAINING REQUIRED FOR SERVICING

This Service Manual is designed for technicians who have the necessary mechanical and electrical knowledge and skills to reliably test and repair the Spin/Relief Grinder. For those without the background, service can be arranged through your local distributor.

This Manual presumes that you are already familiar with the normal operation of the Grinder. If not, you should read the Operators section of this manual, or do the servicing in conjunction with someone who is familiar with its operation.

Persons without the necessary knowledge and skills should not remove the control box cover or attempt any internal troubleshooting, adjustments, or parts replacement.

If you have questions not answered in this manual, please call your distributor. They will contact the manufacturer if necessary.

TORQUE REQUIREMENTS

Throughout this manual we refer to torque requirements as "firmly tighten" or the like. For more specific torque values, refer to the information below.

Bolts Going Into a Nut, or Into a Thread Hole in Steel.
Refer to the table at the right.

Bolts Going Into a Thread Hole In Aluminum
Use the Grade 2 values in the table at the right.

Socket-Head Screws Going Into a Nut or Steel
Use the Grade 8 values in the table at the right.

Machine Screws
No. 6 screws: 11 in.- lbs (0.125kg - m)
No. 8 screws: 20 in. - lbs (0.23 kg - m)
No. 10 screws: 32 in. - lbs (0.37 kg - m)

	GRADE 2 SMOOTH HEAD	GRADE 5 3 MARKS on HEAD	GRADE 8 6 MARKS on HEAD
1/4 In. thread	6 ft-lbs (0.8 kg-m)	9 ft-lbs (1.25 kg-m)	13 ft-lbs (1.8 kg-m)
5/16 In. thread	11 ft-lbs (1.5 kg-m)	18 ft-lbs (2.5 kg-m)	28 ft-lbs (3.9 kg-m)
3/8 In. thread	19 ft-lbs (2.6 kg-m)	31 ft-lbs (4.3 kg-m)	46 ft-lbs (6.4 kg-m)
7/16 In. thread	30 ft-lbs (4.1 kg-m)	50 ft-lbs (6.9 kg-m)	75 ft-lbs (10.4 kg-m)
1/2 In. thread	45 ft-lbs (6.2 kg-m)	75 ft-lbs (10.4 kg-m)	115 ft-lbs (15.9 kg-m)

ASSEMBLY INSTRUCTIONS

UNPACK CARTONS

Remove the wood board structure and plastic wrap around the unit. The cartons should be opened and assembled in the following sequence:

1. Carton Assembly
2. Setup Gage

Remove the two (2) boxes (carton assembly and set up gauge box) and place aside.

If any problems occur, refer to the shipping and receiving instruction. Double check the cartons for any miscellaneous items or other manuals before disposing of cartons.

UNSTRAP CARRIAGE

Remove the shipping strap which holds the carriage in place. The bolt that holds the shipping strap to the frame can be discarded.

REMOVE GRINDER FROM WOOD PALLET

Remove the grinder base from the wood pallet. This is accomplished by unbolting the four bracket that holds each frame side to the bottom of the wood pallet.

THE UNIT WEIGHS 817 LBS. [371 KG], USE POWER EQUIPMENT TO LIFT THE UNIT.

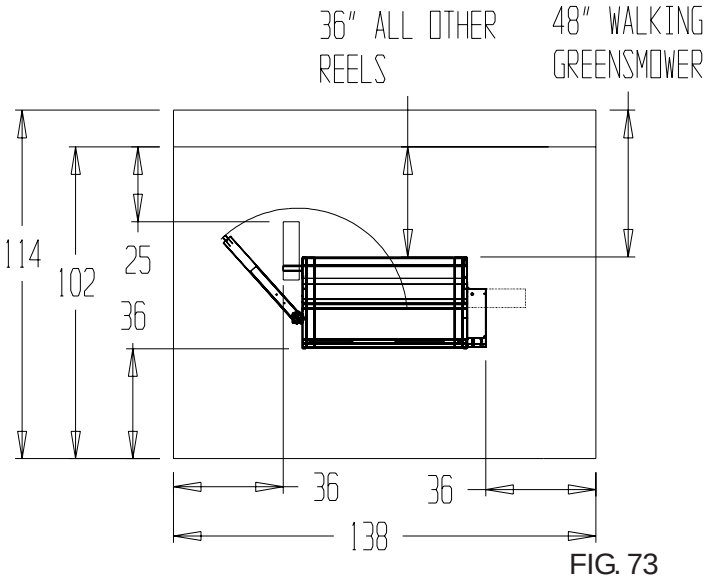


FIG. 73

POSITION BASE

The grinder will require an operating area about 138" [351 cm] x 114"D [290cm] x 90"H [229 cm].
The mowing unit will be lifted from behind the machine, and the machine operator will operate the unit from the operator's position on the opposite side of the unit. Position the base to allow sufficient operating room in both front and behind the machine. See FIG. 73.

The base should be placed on a relatively level concrete floor, with ample ceiling height to allow for the installation and operation of the reel winch and boom. Do not place the unit across two concrete slab seams or across a large crack. If the unit must be placed near a wall, we recommend the wall be located as per FIG. 74.

PLACING THE GRINDER ON FLOORING THAT IS BADLY OUT OF LEVEL OR BROKEN WILL AFFECT GRINDING QUALITY.

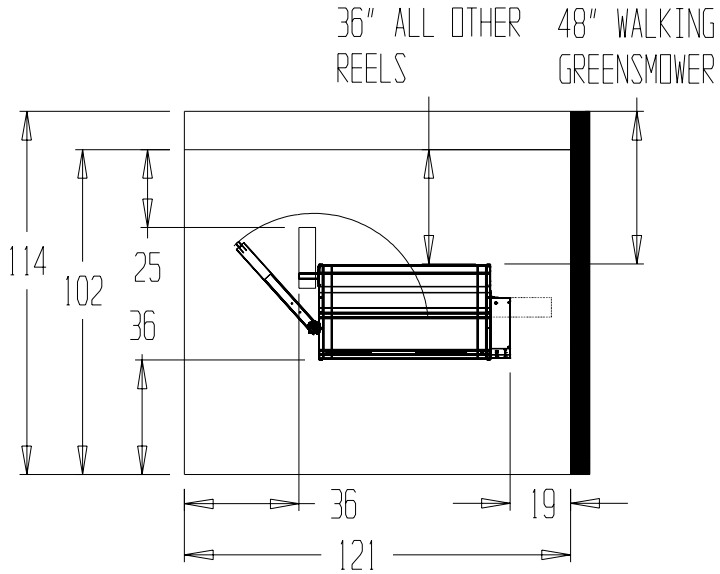
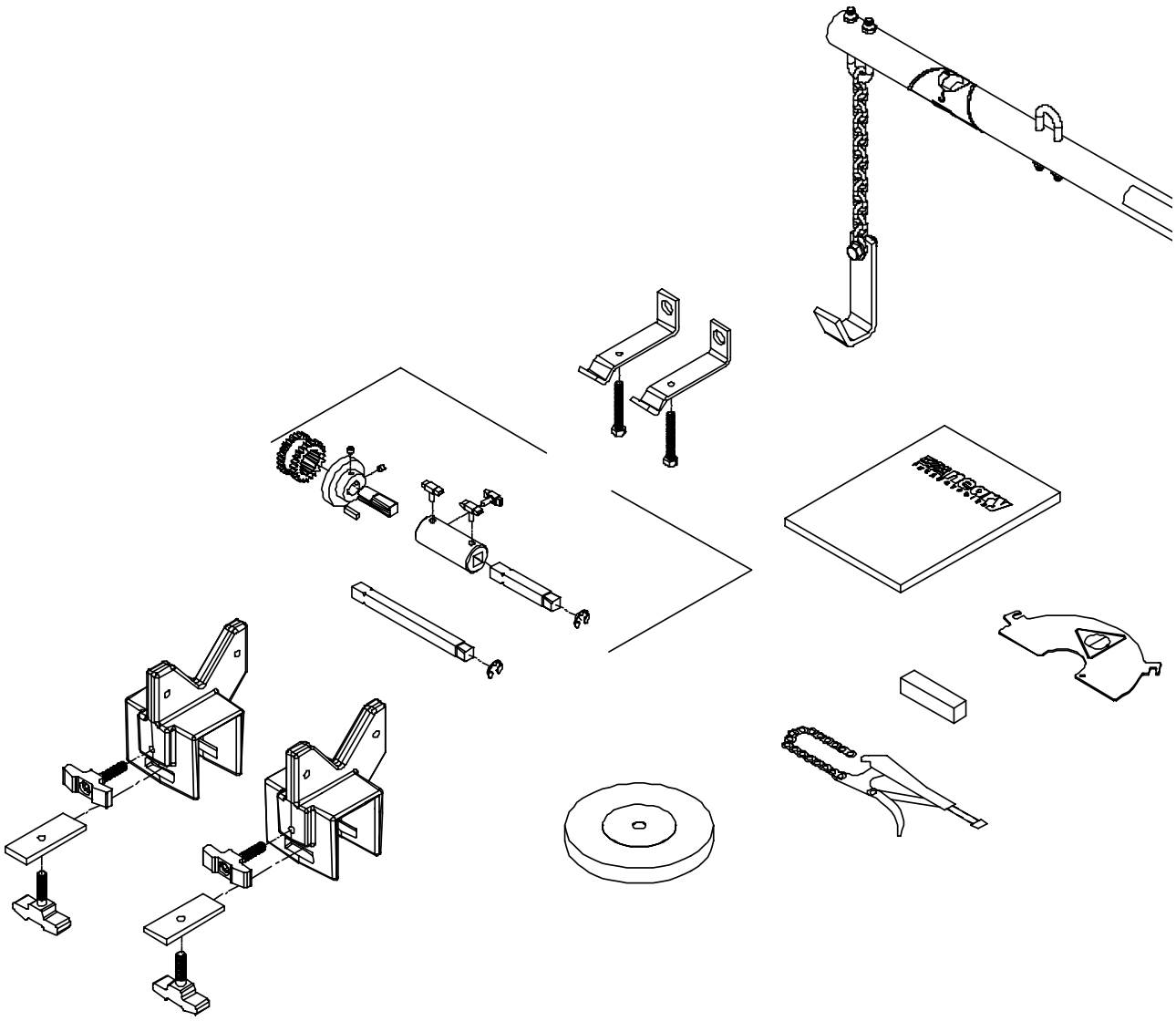


FIG. 74

ASSEMBLY INSTRUCTIONS (Continued)

Remove the carton and remove the contents from the carton onto a workbench. The carton includes:



LEVEL BASE

Each leveling screw has been factory preadjusted so it does not protrudes from the frame tube. See FIG. 3. Place a level on the top of the front carriage rail near one end of the machine and check the level of the unit from side to side. See FIG. 5. Adjust the leveling screws as necessary to bring to level.

Place a level across the front and rear carriage rails near the left end of the carriage bed. See FIG. 6. As viewed from the operator's position, adjust the leveling screw on the left end of the machine as necessary to level the left end. This adjustment is critical to proper operation of your unit.

Place a level across the two carriage rails at the right end of the machine and adjust to level. See FIG. 6. This adjustment is critical. These two steps will level the machine from front to back as viewed from the operator's position.

When both front to back and side to side leveling procedures have been completed, thread the hex jam nuts up against the nut that is welded to the inside of the frame tube until they lock into place. Be careful not to move the leveling screws during this process. See FIG. 3.

Recheck with level after locking nuts are firmly tightened.

FAILURE TO PROPERLY LEVEL YOUR GRINDER, OR BUMPING IT, OR KNOCKING IT OFF LEVEL WILL ADVERSELY AFFECT GRIND QUALITY.

FIG. 75

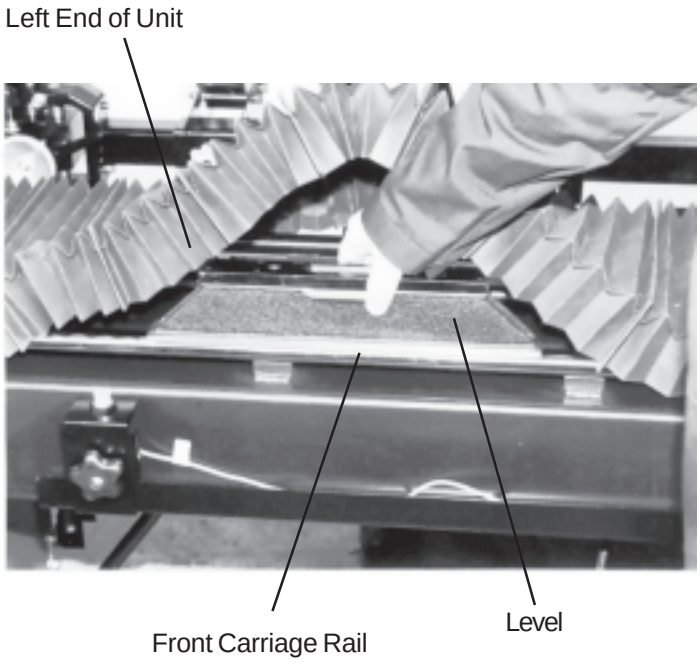


FIG. 76

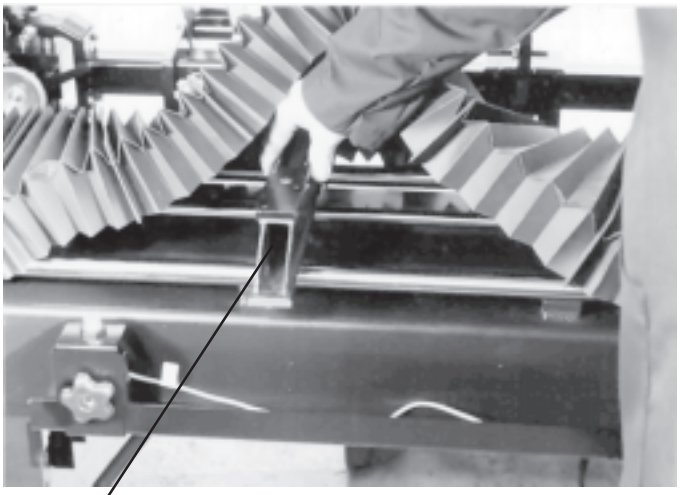


FIG. 77

INSTALL WINCH AND BOOM

With the use of a stool or ladder, install the boom assembly into the boom receiver tube that is welded in the frame. (See FIG. 78)

FIG. 78

SET UP GAUGE ASSEMBLY

1.Remove the dial indicator assembly from carton.
2.Remove anvil on dial indicator.
Mount dial into the casting. Remount anvil. Adjust dial indicator so anvil can be fully depressed without touching the casting and tighten set screw in casting to firmly mount dial indicator to casting.

DO NOT OVERTIGHTEN OR DAMAGE OR MALFUNCTION OF THE DIAL INDICATOR CAN OCCUR.

3.Mount the complete assembly to the machine (See FIG 79 and 80) or store when completed.

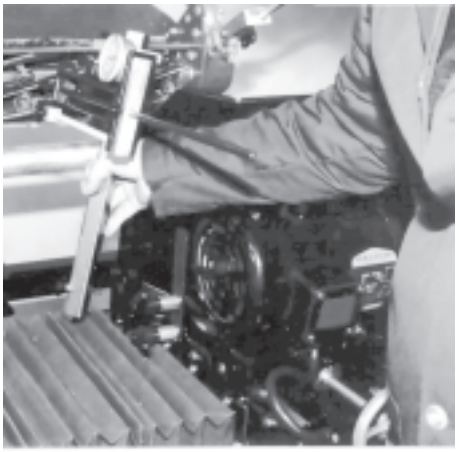


FIG. 79

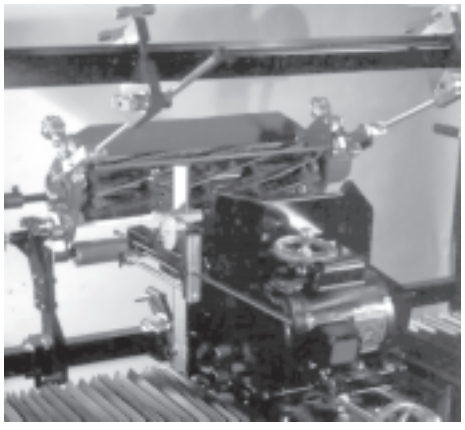


FIG. 80

APPLY POWER

BEFORE YOU APPLY POWER TO THE GRINDER, REFER TO THE "IMPORTANT GROUNDING INSTRUCTIONS" ON PAGE 45.

FIG. 81

120 VOLT MODEL ONLY. Plug the control box power cord into a standard 120V AC 15-amp grounded receptacle. See FIG. 81.

IT IS RECOMMENDED THAT GRINDER HAS ITS OWN PERMANENT POWER CONNECTION FROM THE POWER DISTRIBUTION PANEL, WITH NO OTHER MAJOR POWER DRAW EQUIPMENT ON THE SAME LINE.

IT IS REQUIRED THAT THE POWER DELIVERED TO THIS GRINDER IS 120 VAC - 15 AMPS. THE TOLERANCE ON THIS POWER REQUIREMENT IS +/- 5%. THEREFORE THE MINIMUM VOLTAGE REQUIREMENT IS 114 VAC WITH 15 AMPS. VOLTAGE MUST BE CHECKED WITH ALL EQUIPMENT UNDER LOAD (OPERATING) ON THE CIRCUIT.

DO NOT OPERATE THIS GRINDER WITH AN EXTENSION CORD.

PROPER GROUNDING OF THE RECEPTACLE GROUND IN YOUR BUILDING MUST BE VERIFIED. IMPROPER GROUNDING IN YOUR BUILDING MAY CAUSE THE GRINDER TO MALFUNCTION.

The grinder is equipped with a low voltage relay which is factory preset at 100 VAC. If the power supply line does not deliver 100 VAC power under load, the relay will open and trip out the starter. If this occurs, your power supply line is inadequate and must be correct before proceeding further with the grinder.

FOR 15 AMP RATED LARGE MACHINES

BELOW IS A LIST OF REQUIRED WIRE SIZE IN YOUR BUILDING.

For 0 to 30 Feet from panel to receptacle = Use 14 Ga. Wire.
For 30 to 50 Feet from panel to receptacle = Use 12 Ga. Wire.
For 50 to 80 Feet from panel to receptacle = Use 10 Ga. Wire.
For 80 to 140 Feet from panel to receptacle = Use 8 Ga. Wire.

For 0 to 9 Meters from panel to receptacle = Use 2.5mm Wire.
For 9 to 15 Meters from panel to receptacle = Use 4.0mm Wire.
For 15 to 24 Meters from panel to receptacle = Use 6.0mm Wire.
For 24 to 42 Meters from panel to receptacle = Use 10.0mm Wire.

ASSEMBLY INSTRUCTIONS (Continued)

FOR 220 V 50/60Hz applications
Product No. 1810952 should be ordered.

1810952 includes a 2 KVA 220 Volt Step Down to 110 volt 50/60 Hz transformer which is prewired.

The wiring diagram is shown in FIG. 82.

The power cord has no connector. A connector which is appropriate for your locality and 220 volt, 8 amp application should be installed.

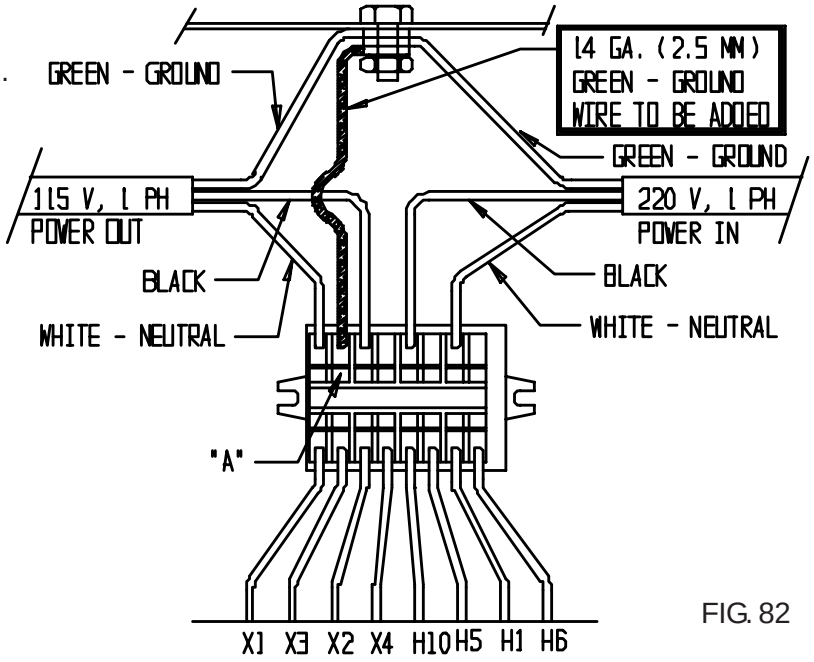


FIG. 82

INDIVIDUALLY WIRE NUT TRANSFORMER LEADS H2, H3, H4, H7, H8 AND H9

USE ONLY A QUALIFIED ELECTRICIAN TO COMPLETE THE INSTALLATION.

INSTALL THE GREEN WIRE SUPPLIED INTO THE TERMINAL BLOCK IN THE HOLE OPPOSITE WIRE X3 AS SHOWN. TO INSTALL THE WIRE INSERT A SMALL SCREWDRIVER INTO THE CAVITY MARKED "A" TO OPEN THE WIRE HOLE.

ATTACH THE OTHER END OF THE GREEN WIRE SUPPLIED TO THE GROUND STUD ON THE TRANSFORMER.

IMPORTANT GROUNDING INSTRUCTIONS

In case of a malfunction of breakdown, grounding reduces the risk of electrical shock by providing a path of least resistance for electrical current.

This Grinder has an electrical cord with an equipment grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded according to all local or other appropriate electrical codes and ordinances.

Before plugging in the Grinder, make sure it will be connected to a supply circuit protected by a properly-sized circuit breaker or fuse.

Never modify the plug provided with the machine--if it won't fit the outlet, have a proper outlet and circuit installed by a qualified electrician.

ALWAYS PROVIDE A PROPER ELECTRICAL GROUND FOR YOUR MACHINE. AN IMPROPER CONNECTION CAN CAUSE A DANGEROUS ELECTRICAL SHOCK. IF YOU ARE UNSURE OF THE PROPER ELECTRICAL GROUNDING PROCEDURE, CONTACT A QUALIFIED ELECTRICIAN.

DAILY MAINTENANCE IS SPECIFIED ON PAGE 5 OF THE OPERATOR'S SECTION OF THIS MANUAL, AND IS TO BE PERFORMED BY THE OPERATOR. LISTED BELOW ARE PERIODIC MAINTENANCE ITEMS TO BE PERFORMED BY YOUR COMPANY'S MAINTENANCE DEPARTMENT:

1. Check gib plate adjustment on the grinder carriage base monthly. See Troubleshooting Section for adjustment.

2. Wipe off and re-oil with spray lubricant the grinding wheel infeed adjusting lead screw and the grinding head height adjustment lead screw, every three months. Wipe off all excess lubricant.

3. Inspect the V-belt for glasing or cracking and adjust the belt tension per procedure specified in the adjustment section every three months.

4. Replace the four foam rail wipers every six months of operation. See FIG. 83.

5. Follow the lubrication procedure for linear bearings. Generally, this will be every six months to a year.

6. Lubricate the gib area on the grinder carriage base with high quality litium grease every six months. Wipe off excess grease.

7. Wipe off and relube with never-seez, the vertical and horizontal cross slide shafts and lead screws, every six months. Wipe of excess grease.

8. Check the free play in the grinding wheel shaft bearing once a year. Replace if excessive play exists.

9. Check the brushes on the auto traverse drive motor and spin motor every 36 months. Replace as necessary. See Troubleshooting Section.

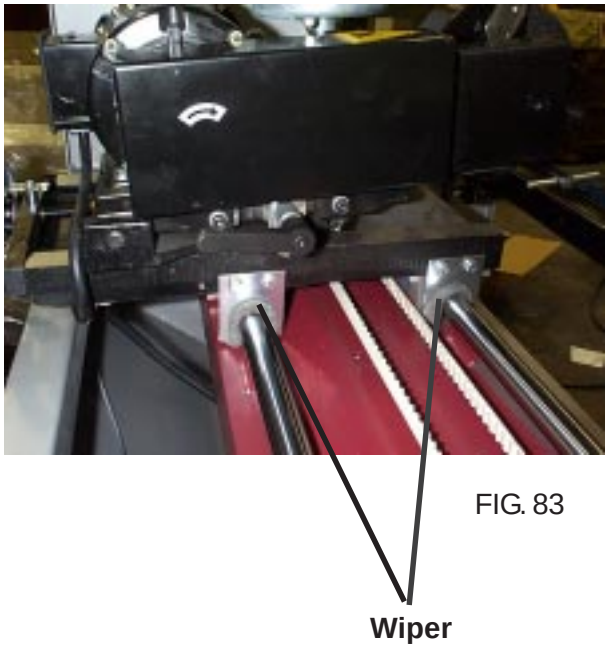


FIG. 83

LUBRICATION OF LINEAR BEARINGS

step 1--Thoroughly clean all both shafts.
Step 2--Flood spray the shafts with a spray lubricant (do not use a teflon based lubricant) until the lubricant is dripping off the shafts. Then run the carriage back and forth through its range of travel. This will carry the lubricant into the bearings.
Step 3--With a clean rag, wipe off the excess amount of lubricant from the shafts. Run the carriage back and forth through its range of travel and wipe the shafts after each traverse. Repeat until the shafts are dry to the feel. This completes the lubrication process.

LUBRICATION FREQUENCY

The lubrication frequency is to check the shaft monthly during grinder operation.

If the unit will be shut down for an extended period of time, more than two weeks, then the shafts and other appropriate parts of the unit should be flooded with lubricant and that lubricant left in place until the unit is brought back into service. When the unit is brought back into service the full lubrication procedure as stated above should be repeated.

FIG. 84

STORAGE PROCEDURE

It is important to follow the procedures below when placing your grinding in storage for an extended period of time. Proper care will help maintain the working functions of the grinder and decrease maintenance and problems that occur when storing the grinder.

BEFORE STORING THE GRINDER:

-Clean the machine thoroughly.
(DO NOT USE COMPRESSED AIR OR A POWER WASHER TO CLEAN THIS MACHINE!)

-Lubricate the following parts by flooding the area with a spray lubricant and leaving it in place: (Do not use a Teflon based lubricant)

Traverse shafts, linear bearings. (see Lubrication section of manual)
Remove grinding wheel and spray the movable parts of the finger system.
Cross slide shafts and adjustment screws.
Scratches in the paint or any other bare metal surfaces

-Work the lubricant in by moving parts through their full range of motion.

-Make sure all controls are in the off position and unplug the unit from the wall.

-Cover the unit if possible with a sheet or tarp.

BRINGING THE UNIT BACK INTO SERVICE:

-Remove the cover and reapply lubricant to the items stated above. Wipe off all excess lubricant. (See Lubrication section for more details.)

-Plug the unit into the wall and test all electrical functions.

-Check the V-belt for cracking and adjust the tension if necessary.

-Check for damaged or missing parts.

ADJUSTMENTS

CARRIAGE LINEAR BEARING REPLACEMENT

STEP 1--Remove the four screws of one linear bearing and slide the linear bearing off the left end of the carriage shaft.

STEP 2--Insert a new linear bearing onto the end of the carriage shaft with the tension adjustment screw pointing outward. See FIG. 86.

STEP 3--Adjust the tension screw of the linear bearing so when you radially rotate the linear bearing around the carriage shaft there should be no free play between the linear bearing and the carriage shaft.

NOTE: Tension is too tight if you feel a cogging action when you rotate the linear bearing around the shaft. This cogging is from the skidding of the bearing on the shaft and indicates the tension screw is to tight. Sliding the bearing block back and forth should be a smooth uniform motion.

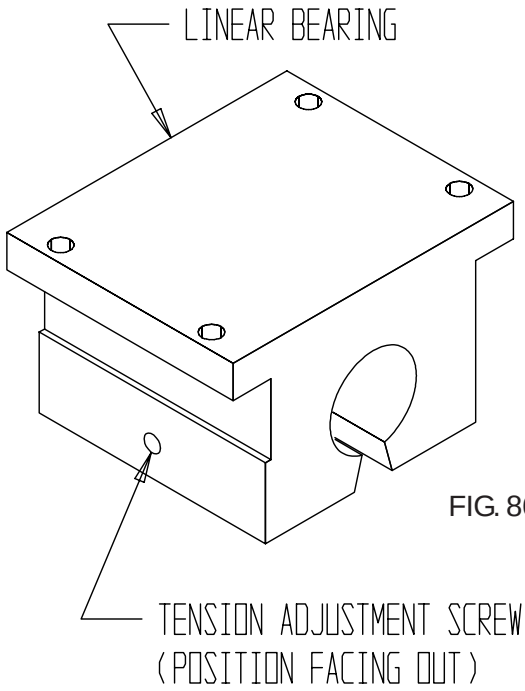


FIG. 86

Repeat Steps 1 through 3 with the other two linear bearings. Note: Both bearings on the shaft nearest the reel must come off the left side of the rail.

SETTING THE BEARING TENSION CORRECTLY IS CRITICAL TO PROPER GRINDING. BEARINGS WHICH ARE TOO TIGHT OR TOO LOOSE WILL CAUSE POOR GRIND QUALITY. ALSO, BEARINGS WHICH ARE TOO TIGHT WILL HAVE SUBSTANTIALLY SHORTER LIVES AND MAY DAMAGE THE SHAFT.

STEP 4--Slide linear bearing under carriage and attach with the four screws.

STEP 5--After all three linear bearings are secured to the carriage, check for correct bearing tension. The bearing tension is correct when you try to lift the carriage and can feel no carriage movement. If there is movement, this means there is up and down free play. The most dependable method of checking free play is to use a magnetic base dial indicator attached to the traverse frame weldment and reading the vertical movement above each bearing. This movement should be within .001" [.03 mm]. When pulling the carriage in the traversing direction, there should be only approximately a three lbs force, with the belt clamp disengaged. To double check the assembly, slide the carriage from "end of travel" to "end of travel", it should have very uniform resistance through its full range.

SPIN GRINDING ATTACHMENT ADJUSTMENT

If play develops so crank handle wants to rotate in the scissor action on the spin grinding attachment, the play can be eliminated by tightening the set screw identified in FIG. 87.

If there is too much play in the spin drive pivot points, torque down the hex nut tight so conical washer is completely compressed, then back off 1/2 turn. See FIG. 24.

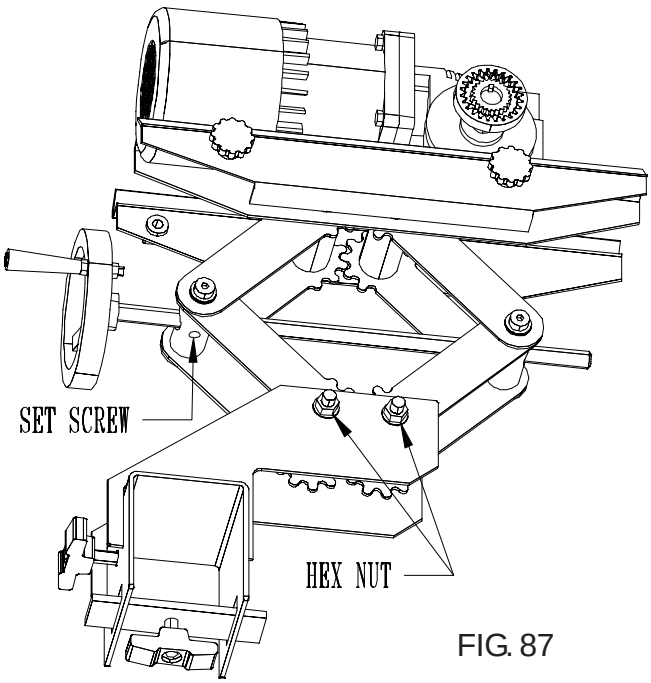


FIG. 87

TO ADJUST THE CARRIAGE GIB PLATE

The gib plate must be readjusted occasionally to eliminate free play. Otherwise, the grinding head can move from side to side, and the reel may be ground unevenly.

The gib must allow the carriage to be cranked freely forward and back without any side play. See FIG. 88.

To adjust:

1. Crank the carriage all the way forward (toward the operator position).

2. Tighten the front gib screw until the carriage has no side play but the horizontal handwheel can still be cranked.

3. Crank the carriage gradually back (away from the operator position), and adjust the remaining gib screws as you go.

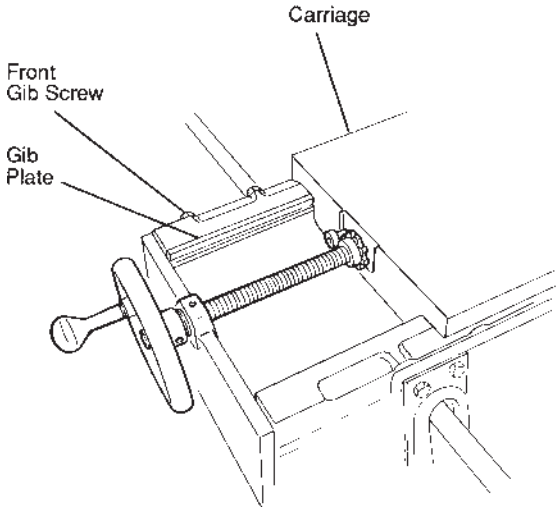


FIG. 88

ADJUSTABLE FINGER BACKSTOP TENSION

If the relief backstop appears to vary during relief grinding, adjust the tension on the nylon plug and set screw. See FIG. 89.

FIG. 89

CROSS SLIDE SHAFT REPLACEMENT

If the cross slide shafts become scarred or gnarled, replace them by the following procedure:

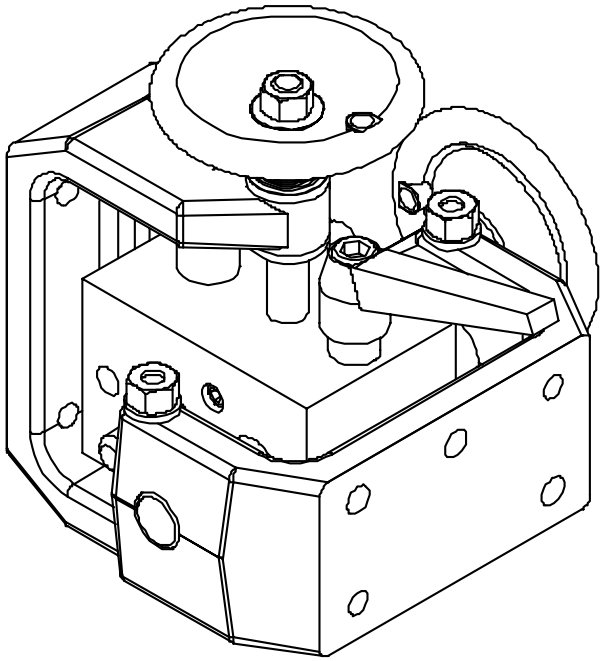


FIG. 90

STEP 1--Loosen the two nuts on the support casting that hold the locking studs and tap with plastic hammer to loosen.
STEP 2--Loosen the locking handles and tap the center stud with a plastic hammer.
STEP 3--Loosen locknut and setscrew and remove the handlwheel.
STEP 4--Remove the Slide Shaft.
STEP 5--Remove all burrs and resurface the shaft to a clean, smooth, polished surface.
(OR REPLACE WITH A NEW SHAFT.)
STEP 6--Coat shaft with Never-Cease and re-install the shaft through the Support, Cross Slide Block and the three Locking studs. The shaft must move freely inside the Cross Slide Block before reassembling.
STEP 7--Retightening the nuts at the end of the locking stud to lock shaft in place.
STEP 8--Reinstall the Handwheel by snuging the setscrew to the flat located on the screw shaft, then torque nut until tight and back off 1/2 turn. Torque the setscrew to 70 in-lbs.
STEP 9--Test the Cross Slide, the handwheel should turn freely.

NOTE: It is also possible to remove the complete Cross Slide Assembly and do the repairs on a bench then reinstall. See FIG. 90 and 91.

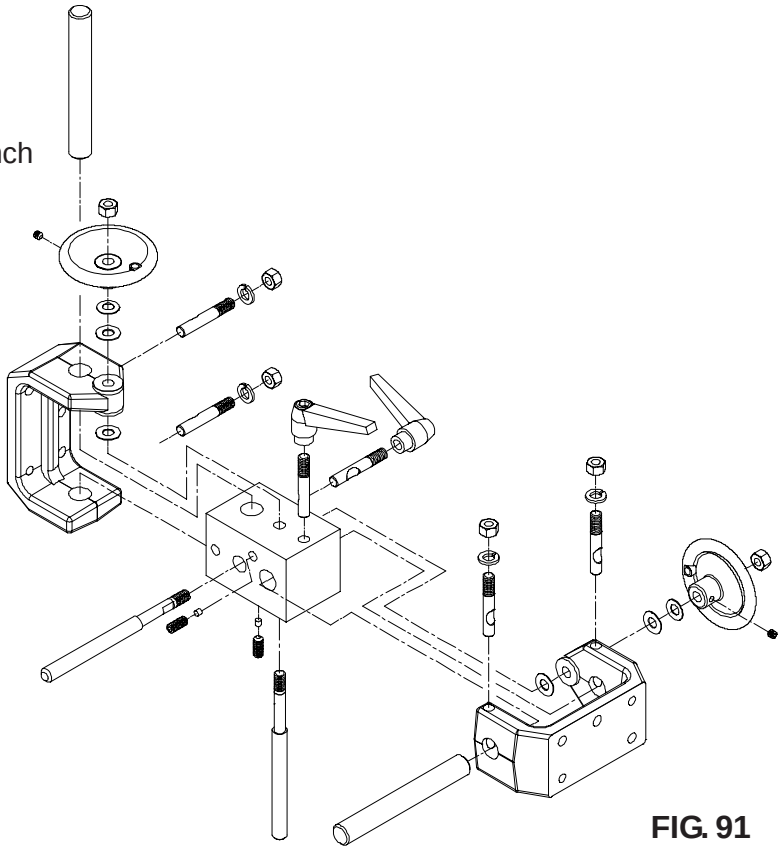


FIG. 91

TRAVERSE BELT TENSION

To adjust the tension on the traverse belt tighten the screws and nuts located at the left side of the traverse belt. Tighten nuts until the comprension springs measure 3/4" [19 mm]. See FIG. 92. If the springs are not tensioned equally, uneven loading on the traverse system may cause parts to fail.

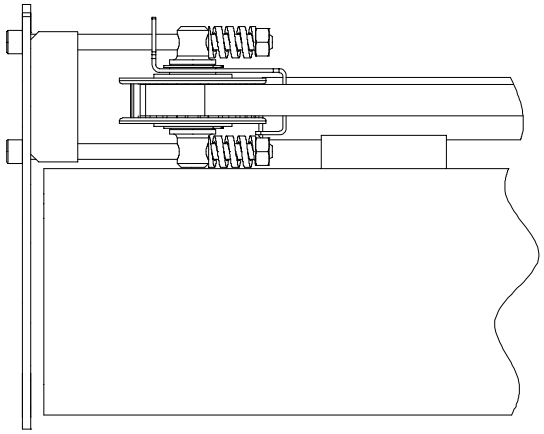


FIG. 92

DO NOT OVERTIGHTEN. OVERTIGHTENING COULD DAMAGE THE BELT OR TRAVERSE DRIVE SYSTEM.

TRAVERSE CLAMP FORCE

If the traverse clamp is slipping during regular operation it may be necessary to tighten the clamp. To tighten, loosen the jam nut and screw the tip out. Move the traverse belt out of the way and verify the clamped distance from the tip to the clamping block (shoe). See FIG. 93. Lock in place by tightening the jam nut against the clamp, being careful not to move the tip.

Do not set the adjustment at less than .10” [2.5 mm]. The .10” [2.5 mm] setting allows slippage in a jam situation and damage can occur if this adjustment is set to narrow.

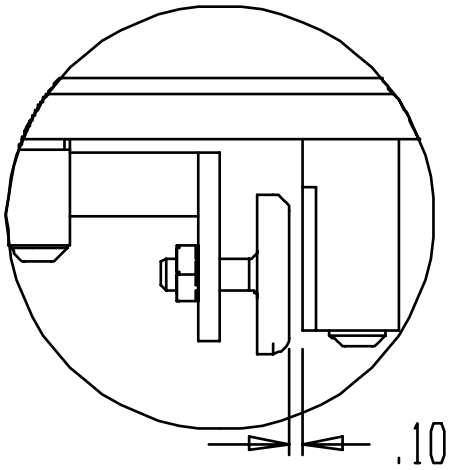


FIG. 93

CAUTION SHOULD BE USED AS ADJUSTING THE TIP WILL AFFECT THE SLIP LOAD AND COULD DAMAGE THE CLAMP TIP, BELT OR TRAVERSE DRIVE SYSTEM.

ADJUSTMENTS (Continued)

BELT TENSION

The belt must be tensioned so when the lock handle is locked the maximum belt deflection is .12 [3 mm] at a 10lb [4.5 Kg] load.

ADJUSTMENTS (Continued)

ALIGNMENT FIXTURE ADJUSTMENT

The body of the dial indicator should be flush with the casting it is mounted in. The anvil should be able to be depressed fully without touching the casting. To adjust properly, loosen the set screw in the indicator mounting casting and adjust accordingly. See FIG. 95.

Tighten dial indicator set screw enough to lightly hold the indicator in place. Never overtighten so plunger does not have free travel.

SET UP GAUGE ADJUSTMENT

There should be no backlash in the fine adjustment screw on the set up gauge slide. See FIG. 96. Adjust hex nut tight so conical washer is completely pressed then back off 1/2 turn.

Make sure the set screw is compressing the nylon plug tightly on the vertical adjusting screw.

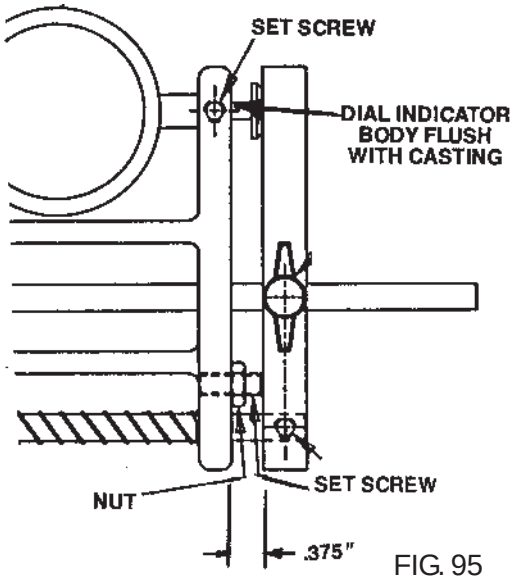


FIG. 95

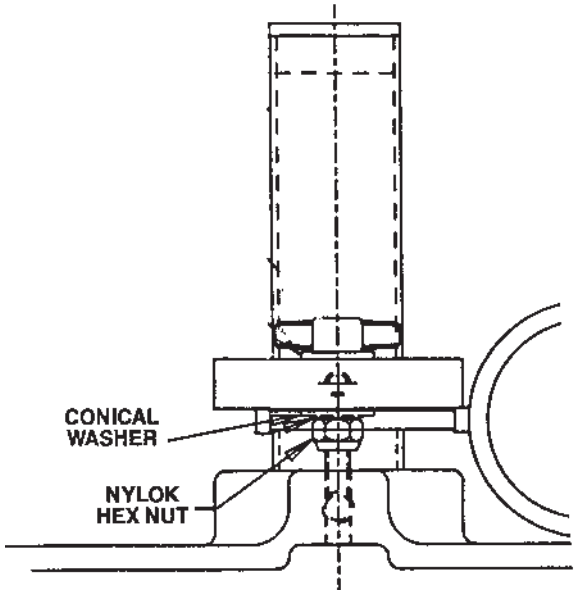


FIG. 96

TO ELIMINATE CARRIAGE INFEED BACKLASH

If there is backlash in the carriage infeed handwheel (See FIG. 97), there are two adjusting points to check:

1.Conical washers behind the shaft adjusting nut:
A. Unscrew the shoulder bolt.
B. Hold the horizontal handwheel, and turn the shaft adjusting nut counterclockwise until the conical washers are touching each other. Continue turning the nut counterclockwise until the next notch is centered over the shoulder-bolt hole. Then turn the nut one notch (40 degrees) further.
C. Reinstall the shoulder bolt to lock the nut in position.

2.Washers behind the handwheel:
A. Loosen (about one-half turn) the set screw holding the handwheel to the shaft. You will have to remove the calibration ring setscrew and go through the hole to access the handwheel setscrew.
B. Tighten the hex nut which secures the handwheel to 100 in.-lbs [1.15 kg-m), then back it off 1/2 turn.
C. Check for .015 in [.4 mm] gap between the wave washer and flat washer. See insert to FIG. 98. Reajust the hex nut if necessary.
D.Tighten the set screw holding the handwheel to the shaft. Reinstall the calibration ring setscrew.

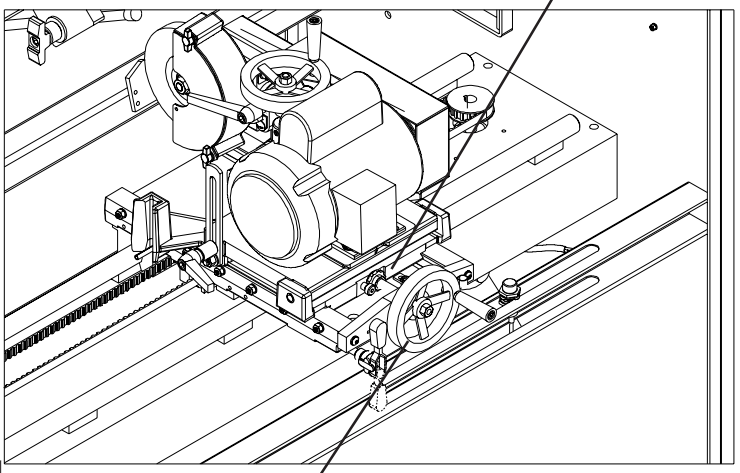


FIG. 97

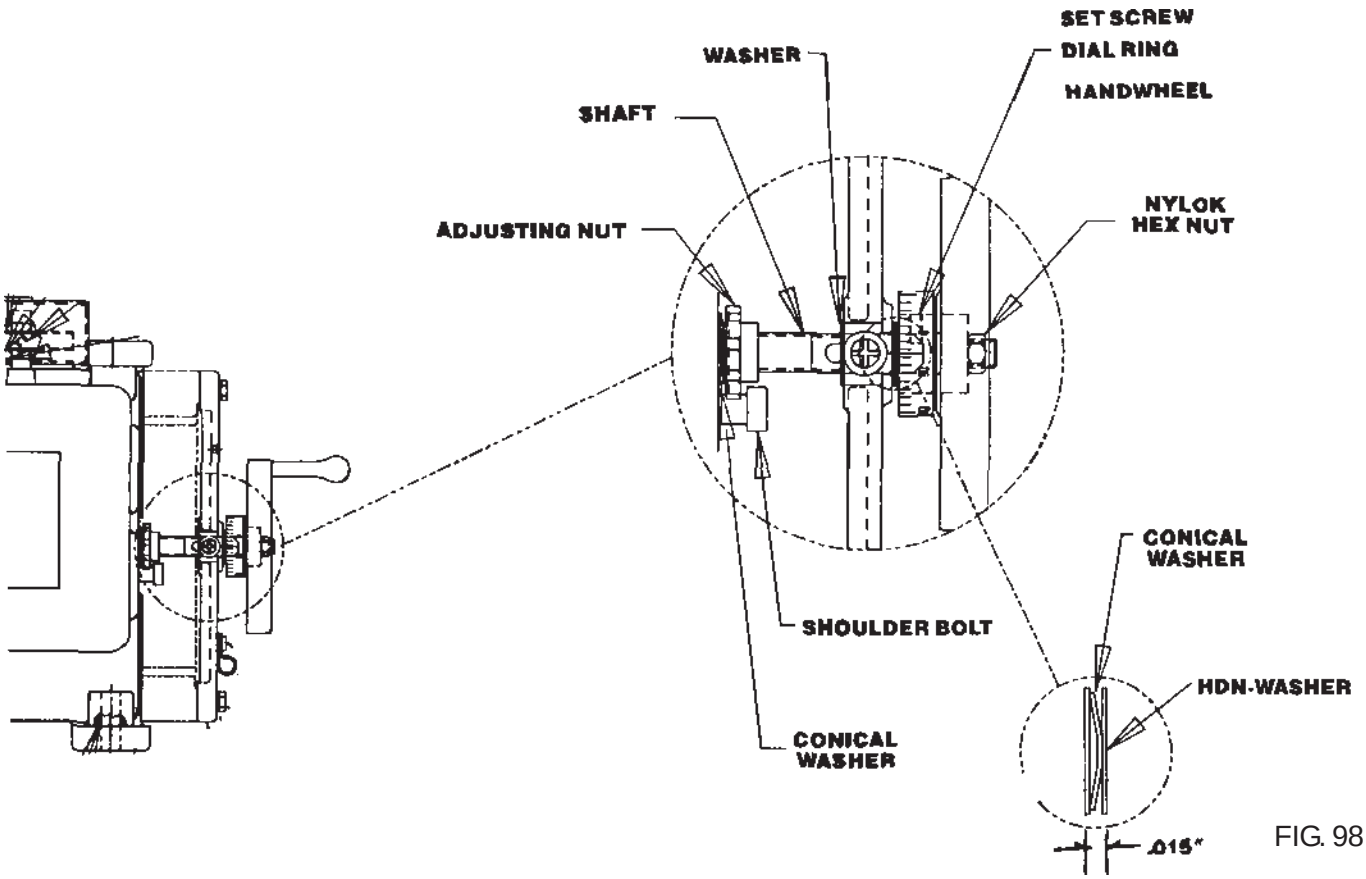


FIG. 98

SPIN DRIVE CONTROL BOARD (SDC)

The Spin Drive Control Board has three potentiometers on the lower board and two potentiometers on the upper board as shown on FIG. 33 and FIG. 34. These potentiometers have been set at the factory to the positions shown on FIG. 33 and FIG. 34.

In the Relief Grinding Mode--
The Relief Speed Pot (RSP) and the Relief Torque Pot (RTP) interact with each other. The (RSP) is located on the upper spin board as a remote speed preset at 9:30 (20 Volts DC). See FIG. 33. The (RTP) is located on the control panel and is for relief torque adjustment.

Relief Speed Pot (RSP) when rotated clockwise will increase maximum spin drive speed. This speed should never be above the 10:30 setting.

Relief Torque Pot (RTP) can vary the reel to finger holding torque for relief grinding. The recommended starting point is 30 in/lbs of torque setting. Never adjust the (RTP) potentiometer dial past the red line marking. Setting the reel to finger torque to high could cause the spin motor system to not operate smoothly.

In the Spin Grinding Mode--
The Spin Torque Potentiometer (STP) and the Spin Speed Pot (SSP) interact with each other. The (STP) is located on the upper spin board as remote torque preset at 2:00 for torque setting. See FIG. 33. The (SSP) is located on the control panel and is for spin speed adjustment.

Spin Torque Pot (STP) controls maximum torque allowable in the spin grinding cycle only. This should never be adjusted past the 2:30 position. If the reel does not turn check that the reel is free turning by hand spinning with the power off and the spin drive disconected.
The Spin speed Pot (SSP) controls reel spin speed, adjust as required. This controls the spin drive speed for spinning the reel.

POTENTIOMETERS ON THE LOWER BOARD OF THE SPIN DRIVE CONTROL (SDC)
See FIG. 34.

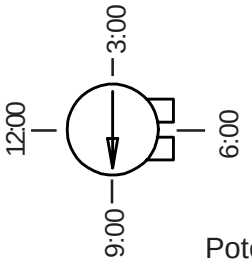
MAX Speed Pot--
The maximum speed is factory preset to 4:30 (fully clockwise) to allow for maximum spin speed.

MIN Speed Pot--
The minimum speed is factory preset at 8:30 (full counterclockwise) so zero speed is obtainable for spin speed.

IR COMP Pot--
The IR Compensation is factory set at 9:00.

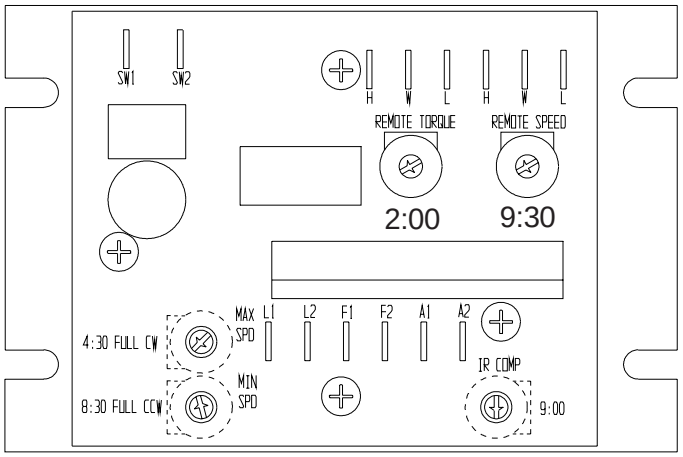
Regulation of the spin or relief grind spin motor may be improved by a slight adjustment of the IR COMP pot clockwise from its factory-set position. Overcompensation causes the motor to oscillate or to increase speed when fully loaded. If you reach such a point, turn the IR COMP pot counterclockwise until symptoms just disappear.

ADJUSTMENTS (Continued)



Potentiometer
Clock Orientation

UPPER SPIN BOARD



LOWER SPIN BOARD

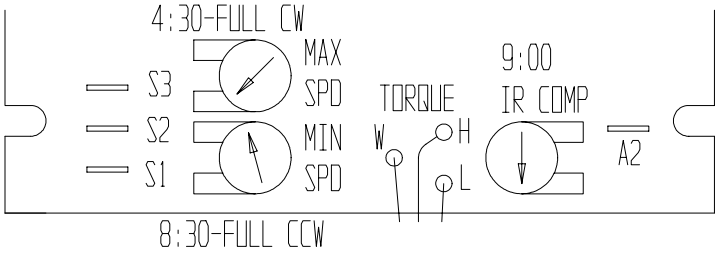
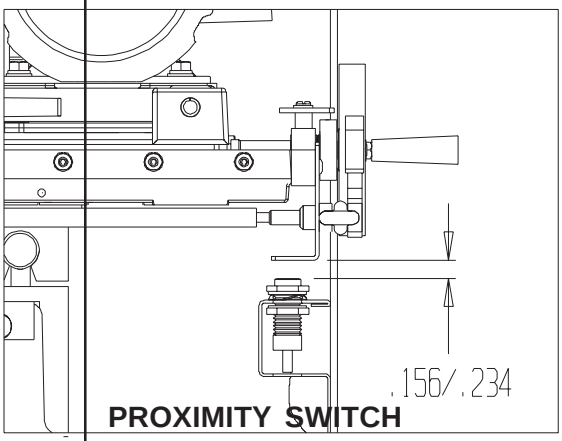


FIG. 34



PROXIMITY SWITCH

For the proximity switch to perform properly and reverse the direction of the carriage at each end of the rails, a distance of 4 mm [.156"] to 6 mm [.234"] needs to be maintained between the proximity sensing bracket and the proximity switch. See FIG. 36.

NOTE: Light on proximity activates when metal crosses over the switch.

FIG. 36

ADJUSTMENTS (Continued)

POTENTIOMETER ADJUSTMENTS TRAVERSE DRIVE CONTROL (TDC)

Min. Speed--Factory set at full (CCW) 8:30. Do not change this setting.

(Right Traverse) Forward Torque--Factory set at full (CW) 4:30. Do not change this setting.
(Left Traverse) Reverse Torque--Factory set at full (CW) 4:30. Do not change this setting.

IR COMP--Factory set to 9:00. IR COMP is current (I) resistance (R) compensation (COMP).
IR COMP adjusts the output voltage of the drive which balances load to motor RPM. Regulation of a traverse motor may be improved by slight adjustment of the IR COMP trim pot clockwise from its factory-set position. Overcompensation causes the motor to oscillate or to increase speed when fully loaded. If you reach such a point, turn the IR COMP trim pot counterclockwise until the symptoms disappear.

Max. Speed--Set at 3:30 for maximum voltage of 90 Volts DC to the traverse motor. When voltage is above 90 volts DC, the traverse motor will start to pulsate and not run smoothly.

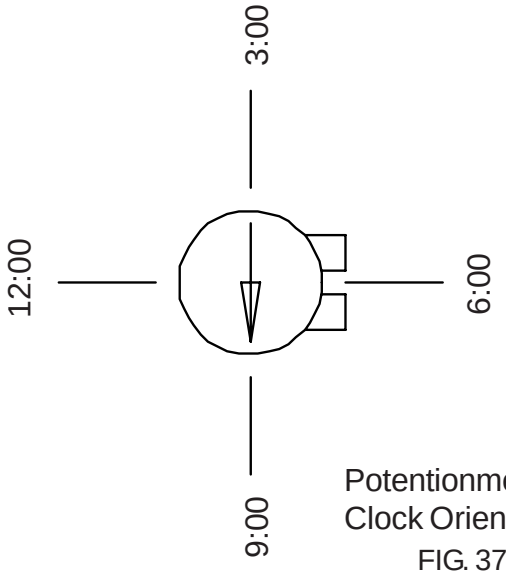
(Right Traverse) Forward Acceleration--Factory set at full (CCW) 8:30. Do not change this setting.
(Left Traverse) Reverse Acceleration--Factory set at full (CW) 8:30. Do not change this setting.

(DB) Dead Band is the potentiometer setting for the 50 or 60 Hz cycle control. Factory set to 9:00, works for both 50 and 60 Hz. Do not change this setting.

Calibrating the **DWELL TIME** rotary DIP switch adjusts the amount of time the process remains in the stop position after a limit switch is actuated. The **DWELL TIME** range is adjustable from 0 - 4 seconds. A DIP switch setting of 0 sets the **DWELL TIME** to 0 seconds, while a setting of 8 sets the **DWELL TIME** to 4 seconds. Dwell time is preset to #4 setting for a 2 second dwell time when reversing at each end of stroke.

Diagnostic LED's indicate the function that is currently being performed:

- **POWER indicates that ac power is being applied to the control.**
- **FORWARD indicates that the process is running in the forward direction (traversing left).**
- **REVERSE indicates that the process is running in the reverse direction (traversing right).**
- **PROX 1 FWD LIMIT lights when the forward limit switch is actuated (left prox).**
- **PROX 2 REV LIMIT lights when the reverse limit switch is actuated (right prox).**
- **DWELL lights when the process remains stopped after a proximity switch is actuated.**



Potentionmeter
Clock Orientation
FIG. 37

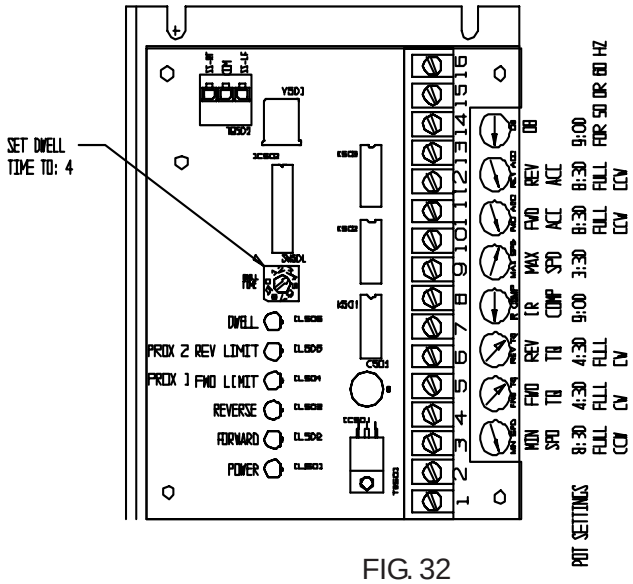


FIG. 32

ELECTRICAL TROUBLESHOOTING

SKILL AND TRAINING REQUIRED FOR ELECTRICAL SERVICING

This Electrical Troubleshooting section is designed for technicians who have the necessary electrical knowledge and skills to reliably test and repair the electrical system. For those without that background, service can be arranged through your local distributor.

This manual presumes that you are already familiar with the normal operation of the Grinder. If not, you should read the Operators section of this manual, or do the servicing in conjunction with someone who is familiar with its operation.

Persons without the necessary knowledge and skills should not remove the control box cover or attempt any internal troubleshooting, adjustments, or parts replacement.

If you have any question not answered in this manual, please call your distributor. They will contact the manufacturer if necessary.

WIRE LABELS

All wires on the grinder have a wire label at each end for troubleshooting. The wire label has a code which tells you wiring information. The wire label has a seven or eight position code. The first two or three digits are the wire number: 01-199. The next three numbers or letters are the code for the component to which the wire attaches. Example: GMC for Grind Motor Control. The last two numbers or letters are the number of the terminal on the component to which the wire attaches.

ELECTRICAL TROUBLESHOOTING INDEX

AC Main Power Controls ..... Page 60-61
Spin Drive Controls in Spin Mode ..... Page 62-63
Spin Drive Controls in Relief Mode ..... Page 64-65
Spin Drive Controls - General ..... Page 66
Grinding Motor Controls ..... Page 67
Traverse Drive Controls-w/prox ..... Page 68-69
Traverse--stopping and reversing ..... Page 70-72

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--AC Main Power Controls: no electrical power to control panel.
Verify all wires shown on the wiring diagram on pages 74-76 are correct and pull on wire terminals with approximately 3 lbs force to verify there are no loose terminal connections and/or no loose crimps between wire and terminal. If problem persists, test as listed below.

Possible Cause	Checkout Procedure	
Emergency Stop Botton(ESS) is Depressed.	**A.** Pull Up on ESS Button	Machine works Yes--end troubleshooting No--go to Step **B.** next
You must push the System Start Switch (SSS) to get power to control Panel.	**B.** Push the SSS. Listen for the Magnetic Starter (MAG) contacts to pull in with a clunk	Machine works Yes--end troubleshooting No--go to step **C.** next.
Main Power Cord is not plugged in.	**C.** Plug in main power cord	Machine works Yes--end troubleshooting No--go to step **D.** next.
ALL switches **MUST** be turned **OFF** for contactor to pull in.	**D.** Turn all switces off.	Machine works Yes--end troubleshooting No--go to step **E.** next.
Main 15 amp outlet circuit breaker has tripped.	**E.** Check circuit breaker in your building and reset if necessary. (Check wall outlet with a light to make sure it works)	Machine works Yes--end troubleshooting No--go to step **F.** next.
No 120 Volts AC power to Filter (FTR).	**F.** Check for 120VAC at Cord into FTR (Power Cord Wire No. 32)	You have 120VAC at Filter input. Yes--but light works in outlet--go to Step **G.** next. No--Replace Power Cord
No 120 Volts AC power out of Filter.	**G.** Check for 120VAC out of FTR	You have 120VAC at Filter output. Yes-- go to step **H.** next. No--Replace the Filter.
No 120 Volts AC power to Main Circuit Breaker (MCB).	**H.** Check for 120VAC to MCB	You have 120VAC at MCB input. MCB Bottom Terminal to Terminal Block 4 (Blue) for 120 Volts AC Yes--Go to Step **I**. next. No--Verify continuity of wires from Filter to MCB and replace if bad.
No 120 Volts AC power from Main Circuit Breaker (MCB).	**I.** Verify that MCB is "ON" or flip switch to "ON" position. Then check for 120VAC out of MCB.	You have 120VAC at MCB output. MCB Top Terminal to Terminal Block 4 (Blue) for 120 Volts AC Yes--If machine works, end of troubleshooting, if not, go to Step **J.** next. No--Replace MCB.

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Causes	***Checkout Procedure***	
120 Volts AC power not delivered to Terminal Strip	**J.** Check for 120 Volts AC at terminal strip.	Terminal "11" on Terminal Strip 2 "7TB2-11" to Terminal Block 4 (Blue) for 120 Volts AC Yes--Go to Step **K**. next. No--Check continuity of wires #7 & #3, Check Jumper on Terminal Blocks 1-3. Replace if bad.
Grinding Motor Switch (GMS) not working	**K.** Check for 120 Volts AC at GMS Terminals 1	Measure 120 volts AC from GMS Terminal 1 to Term Block 4(Blue) Yes--Go to Step **L**. next. No--Flip Switch and check again-Works--Switch is upside down. Does not work-- Check wiring/ Verify Continuity/ Replace Switch
Spin Motor Switch (SMS) not working	**L.** Check for 120 Volts AC at SMS Terminals 1	Measure 120 volts AC from SMS Terminal 1 to Term Block 4(Blue) Yes--Go to Step **M**. next. No--Flip Switch and check again-Works--Switch is upside down. Does not work-- Check Wiring/ Verify Continuity/ Replace Switch
Bad Emergency Stop Switch (ESS)	**M.** Check voltage after the (ESS) MAKE SURE SWITCH IS PULLED UP!	Measure 120 Volts AC from (ESS) term 2 to Term Block 4(Blue) Yes--Go to Step **N.** next No--Check wire for continuity, then verify switch continuity. If bad replace ESS contactor (NC)
Bad System Start Switch (SSS)	**N.** Hold in SSS and Check voltage after the (SSS)	Measure 120 Volts AC from (SSS) term 3 to Term Block 4(Blue) Yes--Go to Step **O.** next No--Check wire for continuity, then verify switch continuity. If bad replace SSS contactor (NO)
Low Voltage Relay (REL) not operating	**O.** Hold in SSS and Check voltage at LVR. LVR must be installed in 8-pin socket.	Measure 120 Volts AC from LVR term 8 to Term Block 4(Blue) Yes--Go to Step **P.** next No--Check for 120 Volts AC from LVR term 6 to term 7. Yes--Verify Continuity of term 1 to term 8 on LVR. Replace LVR if bad. No--Verify Continuity of Wires.
Bad Main Contactor (MAG)	**P.** Hold in SSS and Check voltage at MAG A1 & A2.	Measure 120 Volts AC from MAG Term A1 to Term A2 Yes--MAG Should pull in with clunck, if not replace MAG. No--Verify Continuity of Wires.

ELECTRICAL TROUBLESHOOTING (Continued)

***PROBLEM*--(MAG) turns on only with System Start Switch held in.**

Possible Cause	***Checkout Procedure***	
No Power to MAG holding Contact	**A.** Check voltage to MAG holding contact in.	Measure 120 Volts AC at MAG term T3 to Term Block 4(Blue) with E-Stop Pulled out. (Do NOT press start button while checking.) Yes--Go to Step **B**. next. No--Verify continuity of wiring to MAG T3.
MAG holding contact has failed	**B.** Verify the magnetic starter (MAG) holding contact is working.	Disconnect Wire to MAG L3 and Measure 120 Volts AC from MAG term L3 to Term Block 4(Blue). Press and hold Green Start button to hold in MAG contacts while checking. Yes--Verify continuity of wiring from MAG L3 No--Replace MAG.

PROBLEM--SPIN DRIVE NOT WORKING IN SPIN MODE.

Assuming (SSS) System Start Switch is on with 120 volts AC to control panel and all other functions are working.
Verify all wires shown on the wiring diagram on pages 72-75 are correct and pull on wire terminals with approximately 3 lbs force to verify there are no loose terminal connections and/or not loose crimps between wire and terminal. If loose terminals are found, retighten and retest system. If problem persists, test as listed below.

Possible Cause	***Checkout Procedure***	
Spin Speed Pot (SSP) set to zero	**A.** Set (SSP) to 200 on the control panel.	Spin Motor works Yes--end troubleshooting No--go to Step **B** next
Spin Motor Switch (SMS) is not on	**B.** Turn (SMS) switch on	Spin Motor works Yes--end troubleshooting No--go to Step **C.** next
Spin Rotation Switch (SRS) is not on	**B.** Turn (SRS) switch to the direction of reel rotation required. NOTE: Center position is off.	Spin Motor works Yes--end troubleshooting No--go to Step **C.** next
Circuit Breaker is Tripped (4 AMP)	**C.** Reset Circiut Breaker on front of Control Panel. Push in if tripped.	Spin Motor works Yes--end troubleshooting No--go to Step **D.** next
Spin Drive Control (SDS) is not working	**D.** Check (SDS) L1 to L2 for 120 Volts AC	(SDC) Term L1 to term L2 for 120 volts AC Yes--go to Step **E.** next No--Verify Power to Circuit Breaker and SMS and continuity of wires. Replace CB or SMS if needed.
	E. Check (SDC) A1 & A2 for approx. 120 Volts DC (Have Spin Speed Pot set to 400 RPM)	(SDC) Term A1 to A2 for approx 120 V DC Yes--go to Step **F.** next No--go to Step **L.** next

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Cause	Checkout Procedure	
	F. Check for approx 120 Volts DC input to (SRS)	(SRS) Term 6 to 7 for approx 120 VDC Yes--go to Step **G.** next No--Check continuity of wires and replace if bad.
	G. Check for approx 120 Volts DC out put from (SRS).	(SRS) Term 2 to 3 for approx 120 VDC Yes--go to Step **H.** next No--replace (SRS) switch
Spin Drive motor is bad	**H.** Check spin motor continuity **DISCONNECT POWER FROM MACHINE !**	Remove wires at Terminal Strip 1, Term 4 & 5 check 0 ohms across the black and white wires Yes--end troubleshooting, spin drive should run, if not, replace motor. No--go to Step **P.** next
Spin Speed Pot (SSP) is not working	**L.** (SSP) (10K) on control panel	Spin Drive Control (SDC) Term's Remote Speed W to H Pot Full CCW --O volts DC Pot Full CW--4.4 Volts DC (SDC) Term's Remote Speed W to L Pot Full CCW --4.4 Volts DC Pot Full CW-- DC 0 Volts DC Yes--Go to Step M No--Go to Step N.
Spin Torque Pot (STP) is not set correctly	**M.** Check (STP) remote torque on the top (SDC) board	(STP) on top (SDC) board labeled P501, should be set at 2:00 o'clock position. See Pages xx and xx. Adjust if incorrect and check Spin Drive Function. Yes--end of troubleshooting, spin drive should run. No--Replace (SDC)
(SSP) is not working	**N.** (SSP) (10K) Remove 3 Remote Speed wires. Red wire to term W White wire to term L Black wire to term H **DISCONNECT POWER FROM MACHINE !**	Check for 10,000 ohm Red wire to white wire Full CCW--0 ohms Full CW-10,000 ohms Red wire to black wire Full CCW--10,000 ohms Full CW--0 ohms Yes--replace (SDC) No--replace (SSP)
Worn Motor Brushes	**P.** Inspect Motor Brushes	Remove the brushes one at a time and maintain orientation for reinsertion. See if brush is worn short 3/8" (10 mm) minimum length. Yes--replace motor brushes No--replace Spin Drive Motor

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--Spin Drive not working in relief mode.

Assuming (SSS) System Start Switch is on with 120 volts AC to control panel and all other functions are working.

Verify all wires shown on the wiring diagram on pages 74-76 are correct and pull on wire terminals with approximately 3 lbs force to verify there are no loose terminal connections and/or no loose crimps between wire and terminal. If loose terminals are found, retighten and retest system. If problem persists, test as listed below.

Possible Cause	Checkout Procedure	
Relief Torque Pot (RTP) set to zero.	**A.** Set (RTP) to 20 on the control panel.	Spin Motor works. Yes--end troubleshooting No--go to Step B. next
Spin Motor Switch (SMS) is not on.	**B.** Turn (SMS) switch on.	Spin Motor works. Yes--end troubleshooting No--go to Step C. next
Spin Rotation Switch (SRS) is not on.	**C.** Turn (SRS) switch to direction of reel rotation required. NOTE: Center position is off.	Spin Motor works. Yes--end troubleshooting No--go to step D. next
Circuit Breaker is Tripped (4 AMP)	**D.** Reset Circiut Breaker on front of Control Panel. Push in if tripped.	Spin Motor works. Yes--end troubleshooting No--go to step E. next
Spin Drive Control (SDS) is not working	**E.** Check (SDS) L1 to L2 for 120 Volts AC	(SDC) Term L1 to term L2 for 120 VAC Yes--go to Step F. next No--Verify Power to Circuit Breaker and SMS and continuity of wires. Replace CB or SMS or wires if needed.
	F. Check (SDC) A1 & A2 for approx. 20 Volts DC (Have Relief Torque set to Red Line)	(SDC) Term A1 to A2 for approx 20 Volts DC Yes--go to Step G. next No--go to Step L. next
	G. Check for approx 20 Volts DC output to (SRS)	(SRS) Term 6 to 7 for approx 20 V DC Yes--go to Step H. next No--Check continuity of wires and replace if bad.
	H. Check for approx 20 Volts DC out put from (SRS).	(SRS) Term 2 to 3 for approx 20 V DC Yes--go to Step I. next No--replace (SRS) switch
Spin Drive motor is bad	**I.** Check spin motor continuity **DISCONNECT POWER FROM THE MACHINE**	Remove wires at Terminal Strip 1, Term 4 & 5 check 0 ohms across the black and white wires Yes--end troubleshooting motor should work (if it does not, replace motor) No--go to Step P. next

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Cause	Checkout Procedure	
(RTP) Relief Torque Pot is not working.	**L.** Check (RTP) (50K) on control panel (check voltage with pots at fully clockwise and counterclockwise positions)	(SDC) Term's Remote Torque W to H Pot CCW--) 0 volts DC Pot CW--.2 Volts DC (SDC) Term's Remote Torque W to L Pot CCW--.2 Volts DC Pot CW-- DC 0 Volts DC Yes--go to Step **M.** next No--go to Step **N.** next
Relief Speed Pot (RSP) is not set correctly.	**M.** Check (RSP) remote speed (10k) on (SDC) top board (this is preset to 9:30)	(RSP) on the top (SDC) board labeled P501 should be set at 9:30. See pages xx and xx. Adjust if incorrect and check Relief Torque function. Yes--end of troubleshooting No--replace (SDC)
(RTP) is not working	**N.** (RTP) (50K) Remove 3 Remote Torque Wires red wire to term W white wire to term L. black wire to term H.	Check for 50,000 ohms Red wire to white wire Full CCW--0 ohms Full CW--50,000 ohms Red wire to black wire Full CCW--50,0000 ohms Full CW--0 ohms Yes--Replace (SDC) No--replace (RTP)
Worn Motor Brushes	**P.** Inspect Motor Brushes **DISCONNECT POWER FROM MACHINE !**	Remove the brushes one at a time and maintain orientation for reinsertion. See if brush is worn short 3/8" (10 mm) minimum length Yes--replace motor brushes No--replace Spin Drive Motor

PROBLEM : Spin drive speed goes at one speed only.

Possible Cause	Remedy	
Wiring hookup to potentiometer is improper. (If components have been replaced).	**A.** Check potentiometer wiring for proper hookup. See that speed pot is wired per electrical diagram.	If wiring is wrong, correct and test. Yes--end of troubleshooting No--Go to Step B. next
Defective spin speed control (SSP) potentiometer.	B. (SSP) 10K Remove 3 remote speed wires. red wire to term W white wire to term L black wire to term H	Check for 10,000 ohms Red wire to white wire Full CCW--0 ohms Full CW--10,000 ohms Red wire to black wire Full CCW--10,000 ohms Full CW--0 ohms Yes-- Go to Step C. next No--Replace (SSP)
Main circuit board dial pot settings not correct. (If board has been replaced).	C. Check all pot settings on both boards as of the (SDC) shown on Pages 24 and 25. (See Adjustment Section Spin Drive Control [SDC] Board Setting).	Yes-- end of troubleshooting No--replace (SDC)

PROBLEM: Spin drive motor speed varies

IR Comp trim pot not adjusted properly.	A. See adjustment section for trim pot setting on Page 24.	Original adjustment was not set properly.
Torque to rotate the reel too high.	B. Readjust bearing preload for the reel. Maximum torque load 25 in./lb to rotate reel.	Too much load on drive motor will cause motor to hunt and vary speed.
Check all terminal connections for tightness.	C. When .250 female spade terminals are not tight, remove and crimp slightly together. When reinstalling, push on pressure should have increased for good contact.	When connections are not tight the control board varies voltage to the DC motor which then varies speed.

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM-- Grinding motor not working.
Assuming (SSS) System Start Switch is on with 120 volts AC to control panel and all other functions are working.

Verify all wires shown on the wiring diagram on pages 74-76 are correct and pull on wire terminals with approximately 3lbs force to verify there are no loose terminal connections and/or no loose crimps between wire and terminal. If loose terminals are found, retighten and retest system. If problem persists, test as listed below.

Possible Cause	Remedy	
Grinding Motor Switch (GMS) is not on.	**A.** Turn switch on	Grinding Motor works Yes--end troubleshooting No--go to Step **B.** next
10 Amp Circuit Breaker (CB) is tripped.	**B.** Check 10 amp CB on front of Control panel. Press in if tripped.	Grinding Motor works Yes--end troubleshooting No--go to Step **C.** next
GMS not working.	**C.** Check for power to GMS.	GMS term 5 to Terminal Block 4 (Blue) for 120 V AC Yes--go to Step **D.** next No--With power off, check continuity of wires to GMS.
	D. Check for power from GMS.	GMS Term 6 to Terminal Block 4 (Blue) for 120 V AC Yes--Go to Step **E.** next No--replace GMS
Relay (REL) coil not working.	**E.** Check for power to the (REL) coil.	(REL) Term's A1 to A2 for 120 VAC Yes--Go to Steep F. next. (REL) should pull in, if not replace (REL). No--Check wires to Term's A1 and A2, if bad replace.
	F. Check for power to (REL) relay contacts.	(REL) Term L1 to Term L2 for 120 Volts AC Yes--Go to Step **G.** next No--Check wires to REL Term L1 and L2.
Relay contacts not working	**G.** Check for power from the (REL) relay.	(REL) Term T2 to Term T2 for 120 V AC Yes--Go to Step **H.** next No-- Replace the relay (REL).
Circuit breaker (CB-1) not working.	**H.** Check the power to and from the 10 amp circuit breaker.	(CB-1) input term to Terminal Block 4 (Blue) for 120 VAC. Then (CB-1) output term to Terminal Block 4 (Blue) for 120 VAC. Yes--Go to Step **I.** next. No-- Check appropriate wire and (CB-1), if bad replace.
Relay Not Working	**I.** Turn off Power and disconnect wire to motor. Reconnect Power. Turn on GMS. Check for 120 Volts AC at end of cord.	Measure 120 Volts AC at Grinding Motor Cord Grind Motor End. Yes--Reconnect Motor. If it does not work replace motor. No--Verify Continuity of grind motor wire and replace if bad.

DISCONNECT POWER FROM MACHINE!

ELECTRICAL TROUBLESHOOTING (Continued)

PROBLEM--Traverse Drive not working.

Assuming (SSS) System Start Switch is on with 120 volts AC to control panel and all other functions are working.

Verify all wires shown on the wiring diagram on pages 74-76 are correct and pull on wire terminals with approximately 3lbs force to verify there are no loose terminal connections and/or no loose crimps between wire and terminal. If loose terminals are found, retighten and retest system. If problem persists, test as listed below.

Possible Cause	Checkout Procedure	
Traverse Motor Switch (TMS) is not on.	**A.** Turn on (TMS)	Traverse works Yes--end troubleshooting No--got to Step **B.** next
Traverse Speed Pot (TSP) set to zero.	**B.** Set (TSP) to 35 on the control panel	Traverse works Yes--end troubleshooting No--go to Step **C.** next
Fuse on Traverse Drive Control (TDC) has failed.	**C.** Check fuse and replace if failed. See Page 23. Too heavy a grind causes grinding head traverse motor to overload and blow the fuse, NOTE: Fuse can not be checked visually. Fuses must be continuity checked.	Traverse works Yes--end troubleshooting No--go to Step **D.** next
Traverse Drive Control (TDC) is bad	**D.** Check for 120 Volts AC incoming to (TDC)	On (TDC) Terminal L1 to L2 for 120 VAC Yes--Go to Step **F.** next No--Go to Step **E.** next
Bad Traverse Motor Switch (TMS)	**E.** Check for 120 Volts AC at (TMS). (Make certain (TMS) is on)	Measure 120 volts AC from TMS Terminal 5 to Term Block 4(Blue) Yes--Check wires to the (TDC) and replace if bad. No--Flip Switch and check again- Works--Switch is upside down. Does not work-- Check wiring/Verify Continuity/ Replace Switch or wires.

ELECTRICAL TROUBLESHOOTING (Continued)

Possible Cause	Checkout Procedure	
No DC Voltage from (TDC) Traverse Drive Control	**F.** Check for 90 Volts DC across (TDC) terminals #A1 to #A2 this voltage drives the DC traverse motor. NOTE: Traverse must be on and have (TSP) turned full CW to maximum voltage of 90 VDC.	Check (TDC) terminals #A1 to #A2 for 90 Volts DC Yes--go to Step **G.** next No--go to Step **H.** next
Traverse Motor is bad	**G.** Check grinding motor continuity **DISCONNECT POWER FROM MACHINE**	Remove motor wires from Terminal Strip 1 terminals #7 & #8 check for 0 ohms across the black and white wires Yes-end troubleshooting, traverse should work, if not, replace motor. No--go to Step **J.** next
(TSP) is not working	**H.** Check (TSP) (10K) on control panel	(TDC) Pin #8 to #7 Pot Full CCW Pot Full CW 0 VDC 9.75 VDC Pin #8 to 9 Pot Full CCW Pot Full CW 9.75 VDC 0 VDC Yes--replace the (TDC) No--go to Step **I.** next
(TSP) (10K) is bad	**I.** Check (TSP) for 10,000 ohms. Remove three wires from (TDC) red from term #8 white from term #7 black from term #9	Check for 10,000 ohms red to white wires Full CCW--0 ohms Full CW--10,000 ohms Red to black wires Full CCW--10,000 ohms Full CW--0 ohms Yes--replace the (TDC) No--replace (TSP)
Worn motor brushes	**J.** Inspect Motor Brushes **DISCONNECT POWER FROM MACHINE**	Remove the brushes one at a time and maintain orientation for reinsertion. See if brush is worn short, 3/8" (10 mm) minimum length. Yes--replace motor brushes No--replace Traverse Motor

PROBLEM--Traverse does not stop to reverse directions when flag goes under the proximity switch on the left side or right side of machine.

Gap between flag and prox is incorrect.	A. Gap between flag and prox should be 3/16 to 1/4" (4-6 mm). Prox LED does not light when flag is under prox.	If incorrect, adjust per adjustment section of manual. Yes--end troubleshooting No--go to Step B. next	
Proximity Switch is bad.	B. Proximity switch is not working properly or wire connections are loose.	First check to see if proximity light comes on. When the light is on, it means that there is electricity coming to proximity switch. Actuate prox switches with steel tool to take measurements.	The light coming on shows the proximity is getting electrical contact.
		Left proximity (PROX 1) check Traverse drive Control (TDC) between terminals #14 (black wire) and #15 (brown wire).	Proximity light on- 0 Volts DC Proximity light off- 12 Volts DC
		Right proximity (PROX) check between terminals #14 (black wire) and #15 (brown wire).	Proximity light on- 0 Volts DC Proximity light off- 12 Volts DC
			Replace proximity switch if the voltages do not read as above.

PROBLEM--Traverse speed control goes at one speed only.

Possible Cause	Checkout Procedure	
Defective speed control potentiometer	**A.** Check potentiometer on control panel.	Traverse Drive Control Pin #8 to 7 Pot full CCW Pot Full CW 0 VDC 9.75 VDC Pin #8 to 9 Pot full CCW Pot Full CW 9.75 VDC 0 VDC Yes--Pot is OK No--Go to Step **B.** next
	B. Check potentiometer for 10,000 ohms. Remove three wires from Traverse Drive Control red from term #8 white from term #7 black from term #9	Check for 10,000 ohms Red to White wires Full CCW - 0 ohms Full CW - 10,000 ohms Red to Black wires Full CCW - 10,000 ohms Full CW - 0 ohms Yes--Go to Step **C.** next No--replace potentiometer. Wiper inside of potentiometer controls speed. Wiper may be bad and not making contact.
Wiring hookup to potentiometer is improper. (If components have been replaced.)	**C.** Check potentiometer wiring for proper hookup. See that speed pot is wired per electrical diagram	Wrong wire hookup effects traverse control. Check for Proper function. Yes--end troubleshooting No--Go to Step **D.** next Minimum and maximum pot settings effect traverse speed.
Main circuit board dial pot settings not correct. (If board has not been replaced.)	**D.** Check all pot settings on circuit board as shown in wiring diagram. (See adjustment section Traverse Motor Control Board Settings.)	Incorrect potentiometer settings effects traverse control. Check for proper function. Yes--end of troubleshooting No-- replace (TDC)

PROBLEM--If the carriage traverses to one end of stroke or the other and it stops and does not reverse direction.

Possible Cause	Remedy	Reason
Proximity switch is not working properly or wire connections are loose	First check to see of proximity light comes on. When the light is on, it means that there is electricity coming to proximity switch. Actuate prox switches with steel tool to take measurements.	The light coming on shows the proximity is getting electrical contact.
	Left proximity (PROX1) check Traverse drive Control (TDC) between terminals #14 (black wire) and #15 (brown wire).	Proximity light on- 0 Volts DC Proximity light off- 12 Volts DC
	Right proximity (PROX) check (TDC) between terminals #13 (black wire) and #15 (brown wire).	Proximity light on- 0 Volts DC Proximity light off- 12 Volts DC
		Replace proximity switch if the voltages do not read as above.
The dwell time on the traverse drive control not set properly.	Reset dwell time as required. One increment increases Dwell time by 1/2 second. NOTE: Factory dwell setting is 4.	
Loose wire to proximity switch.	Check wire connections from the proximity switches and tighten down screws.	A loose wire connection will give intermittent electrical contact.

MECHANICAL TROUBLESHOOTING

PROBLEM--Reel ground concave, convex or with irregular shape.

Possible Cause	Checkout Procedure
Too heavy a grind on the final grinding passes.	Grind out reel using correct sparkout procedure as specified in the Operators Manual.
Overhead clamps and tooling bar clamps not tight.	Tighten all locking hand knobs, Four knobs on the tooling bar, four knobs on the overhead bar clamp and two on the overhead clamp swivels. When using center brackets, insure the fixed center is tight as well as the moveable center lock knob.
Cross slide lock handles not tight.	Tighten the horizontal and vertical cross slide lock handles.
Grinding head lock handles not tight.	Tighten the two lock handles on the adjusting arm slots and one on the vertical height adjustment.
Loose gibs on the carriage.	Adjust the gibs per the procedure in the adjustment section in this manual.
Linear bearings on the grinding head carriage are bound with grit, loose or damaged .	The lineal bearing must be preloaded to the traverse shafts with no vertical movement. See manual adjustment section for carriage linear bearing adjustments. Lubricate the linear bearings per the procedure as specified in this manual. Replace bearings if they cannot be properly adjusted.

PROBLEM--Roundness of reel varies, High low reel blades are observed.

Possible Cause	Checkout Procedure
Too heavy a grind on the final grinding passes.	Grind out reel using correct sparkout procedure as specified in the Operators Manual.

PROBLEM--Stock removal much differant traversing left compared to traversing right.

The possible causes and checkout procedures are the same as listed above for concave, convex or with irregular shape.

MECHANICAL TROUBLESHOOTING (Continued)

PROBLEM--Relief grind on the reel blades does not go full length.

Possible Cause	Checkout Procedure
The right side corner of the grinding wheel is always to be in contact with the reel blade. This is high point of the relief finger.	The right hand side of the grinding wheel is not in full contact for relief grinding. See Operators Manual for NORMAL HELIX AND REVERSE HELIX for information on using the grinding wheel.

PROBLEM--Too heavy a burr on cutting edge of reel blades.

Possible Cause	Checkout Procedure
Traverse speed set too high causing a heavy burr on the reel blade when spin grinding.	Traverse speed should be set lower approximately 12 ft/min. (meters/min.) for a smaller burr on cutting edge.
Too heavy a grind on the final grinding passes.	Grind out reel using correct sparkout procedure as specified in the Operators Manual.

PROBLEM--Cone shaped reel after grinding.

Grinding head travel not parallel to the reel center shaft.	Grinding head travel was not setup parallel to the reel center shaft in vertical and horizontal planes. See Align the Reel Section in operator's Manual

PROBLEM-- Traverse speed is too slow.

Possible Cause	Remedy
Lineal bearing in the carriage are set too tight.	Readjust linear bearings for proper tension per the adjustment section of this manual.
Traverse drive belt tension springs set too tight	Check to see if traverse drive belt tension springs have been overloaded, causing the bearings to not rotate freely. Verify proper adjustment per the adjustment section of this manual.

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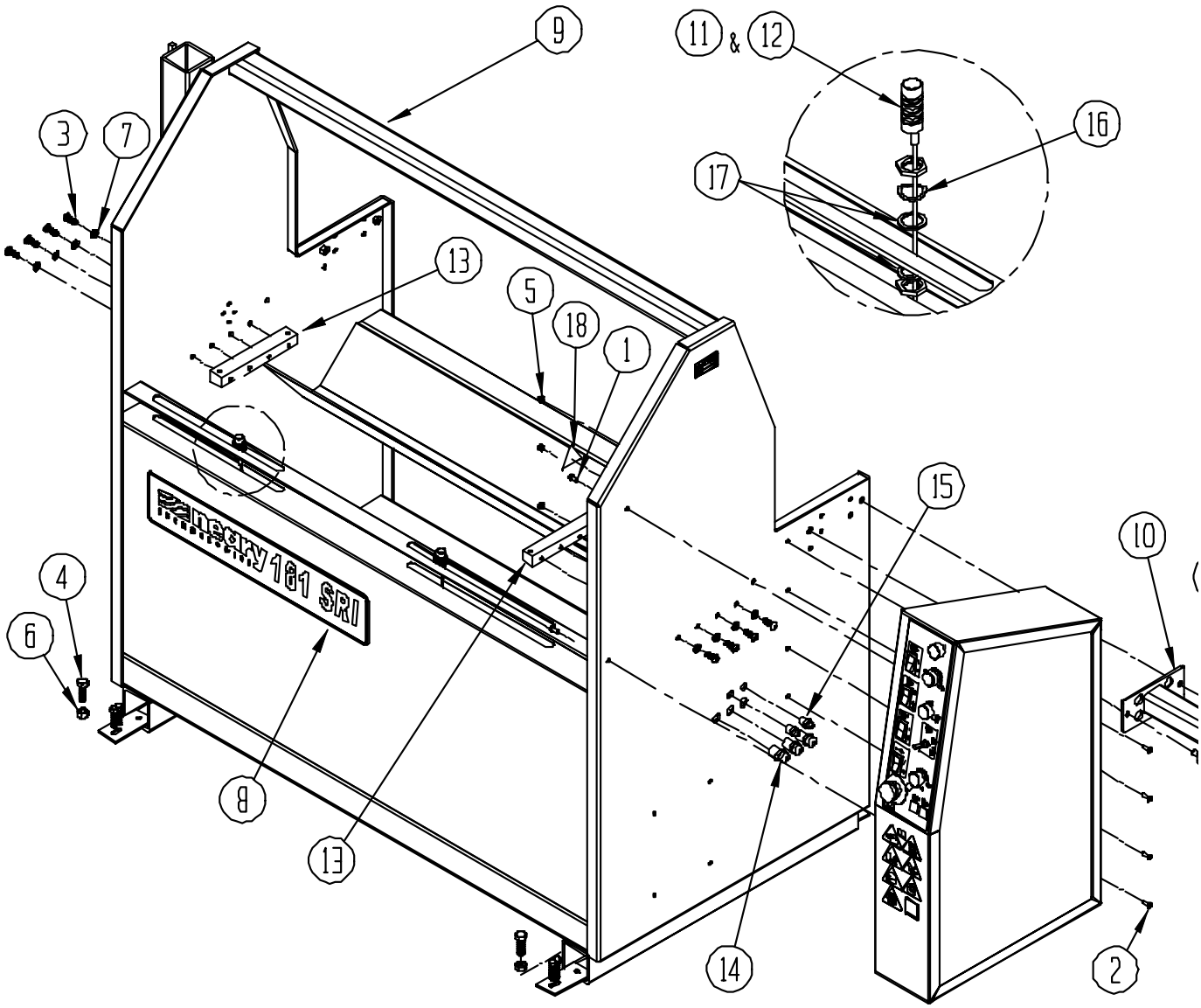
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	B251016	Button Head Socket Cap Screw 1/4-20 x 5/8 Long
2	B251216	Button HeadSocket Cap Screw 1/4-20 x 3/4 Long
3	B371616	Button Head Socket Cap Screw 3/8-16 x 1 Long
4	B502401	Hex Head Cap Screw 1/2-13 x 1-1/2 Long
5	J257100	1/4-20 Hex Locknut
6	J502000	1/2-13 Hex Jam Nut
7	K371501	3/8 Lockwasher
8	18081	Decal 181SRI
9	18515	Cabinet Weldment
10	18517	Tooling Bar Extension Weldment
11 & 12	3707601	Proximity Head - 18MM DC
11	27168	Proximity Cord - Traverse Left Hand
12	27169	Proximity Cord - Traverse Right Hand
13	28182	Channel Support Bar
14	3707009	Strain Relief - .27/.47 Cord Diameter
15	3707029	Strain Relief - .19/.30 Cord Diameter
16	3708419	Wave Spring - .78 ID
17	3708421	Flatwasher - .75 ID x 1.0 OD x .075 Thick
18	3707448	Warning Decal - Electrical
19	6109570	T - Knob Assembly - 3/8-16 x .75 Long

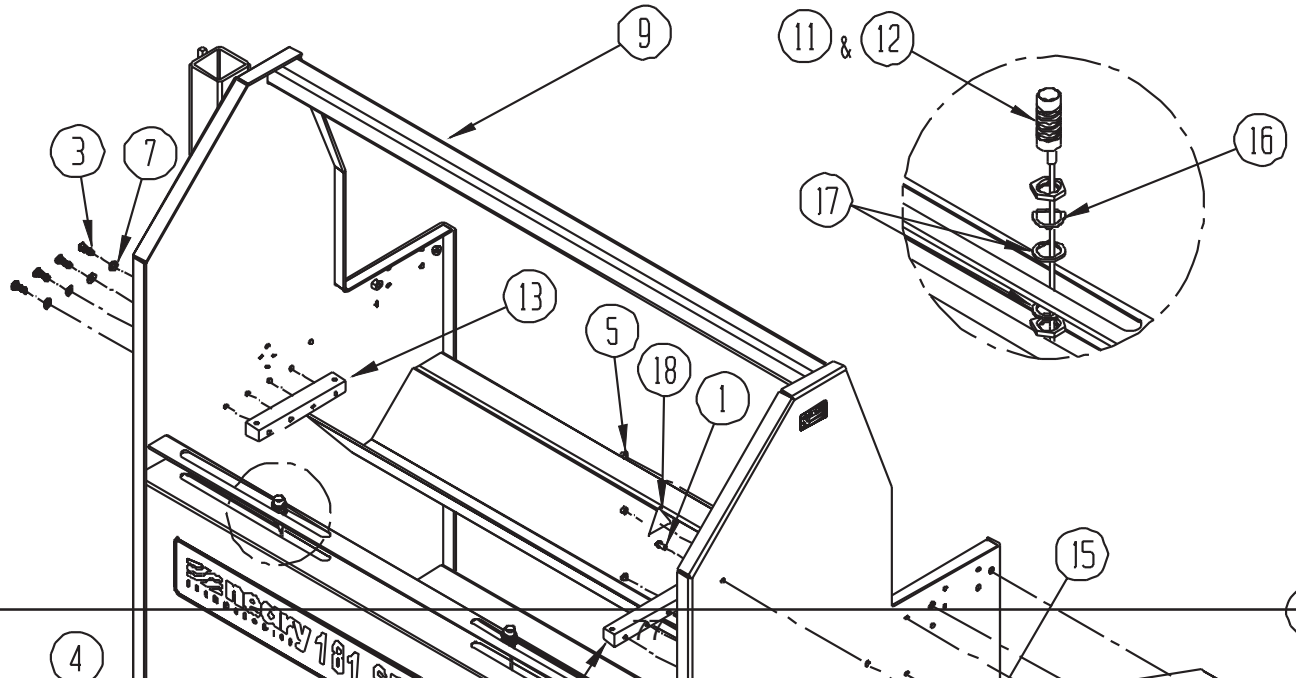

DIAGRAM NO.	PART NO.	DESCRIPTION
1	C250420	1/4-20 x 1/4" Long Socket Set Screw
2	C311220	5/16-18 x 3/4" Long Socket Set Screw
3	J371000	3/8-16 Hex Nut
4	J377000	3/8-16 Jam Locknut
5	K371501	3/8 Split Lockwasher
6	3579109	3/16 Dia. Nylon Plug
7	3708393	Handwheel
8	3709062	Conical Washer
9	3709304	Thrust Washer
10	3708437	3/8-16 Adjustable Handle
11	6009027	Acme Adjusting Shaft
12	6009035	3/8-16 Locking Stud Shaft
13	6009081	Cross Slide
14	6009082	Cross Slide Support
15	6009095	Slide Shaft

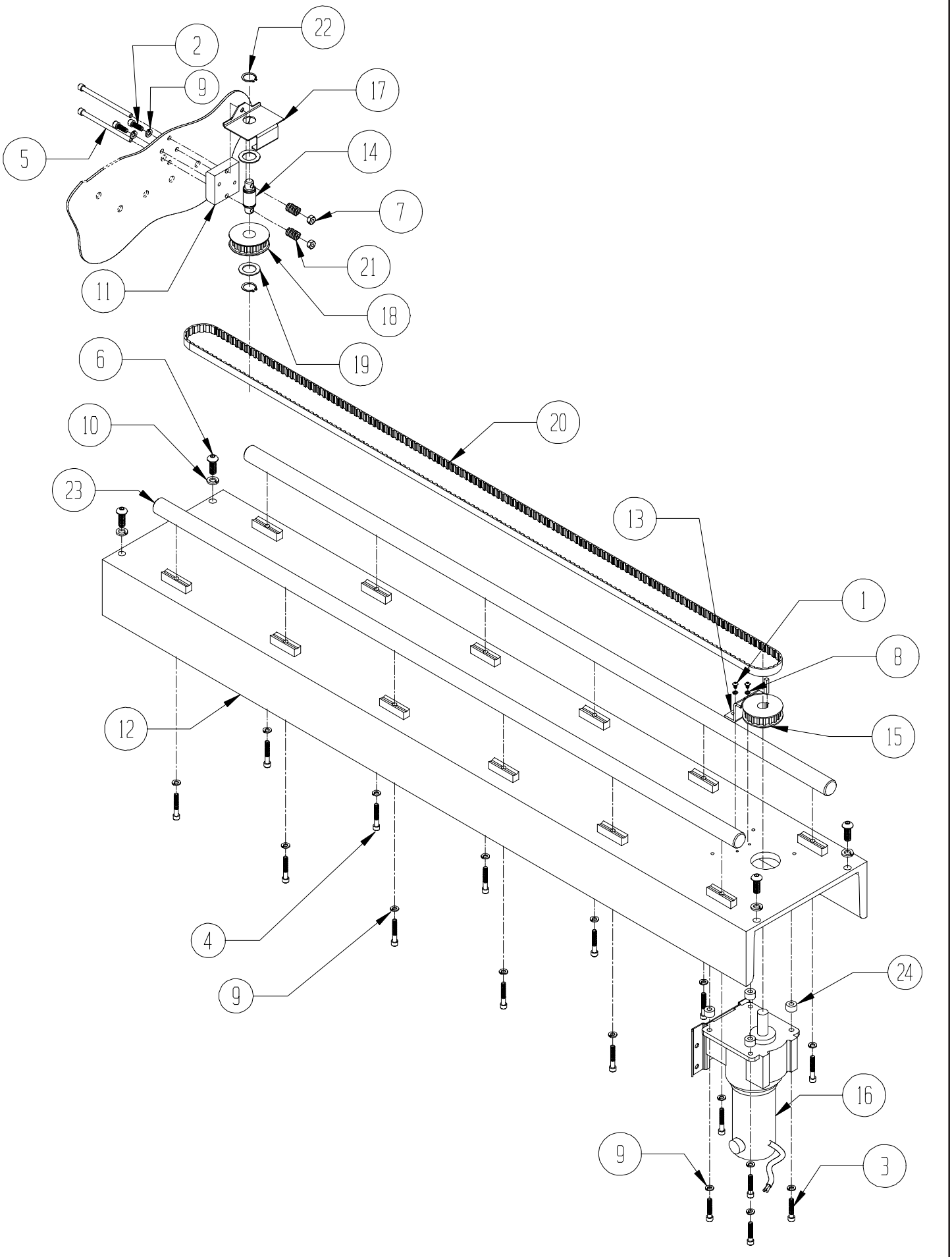
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DIAGRAM NUMBER	PART NUMBER	DESCRIPTION
1	B160607	8-32 x 3/8 Button Head Socket Cap Screw
2	B251211	1/4-20 x 3/4 Socket Head Cap Screw
3	B251611	1/4-20 x 1/4 Socket Head Cap Screw Full Thread
4	B252411	1/4-20 x 1-1/2 Socket Head Cap Screw
5	B256411	1/4-20 x 4 Socket Head Cap Screw
6	B371616	3/8 - 16 x 1 Button Head Socket Cap Screw
7	J257000	1/4-20 Locknut Thin
8	K161501	#8 Lockwasher Split
9	K251501	1/4 Lockwasher Split
10	K371501	3/8 Lockwasher Split
11	28192	Support - Travel Pulley
12	28195	Channel - Machined
13	28197	Guard - Travel RH
14	50309	Shaft- Travel Pulley
15	50354	Pulley - Cog Drive
16	6059062	Motor Assembly - Travel W34
17	50363	Guard - Traverse Pulley
18	55553	Idler Pulley Assembly
19	80355	Washer - Thrust .75ID x 1.25OD
20	80375	Belt -Cog
21	3708658	Spring - Compression
22	3709331	Ring - Retaining Ext
23	6509063	Shaft - Carrier
24	3708884	Spacer .281 ID x .62 OD x .38 Long

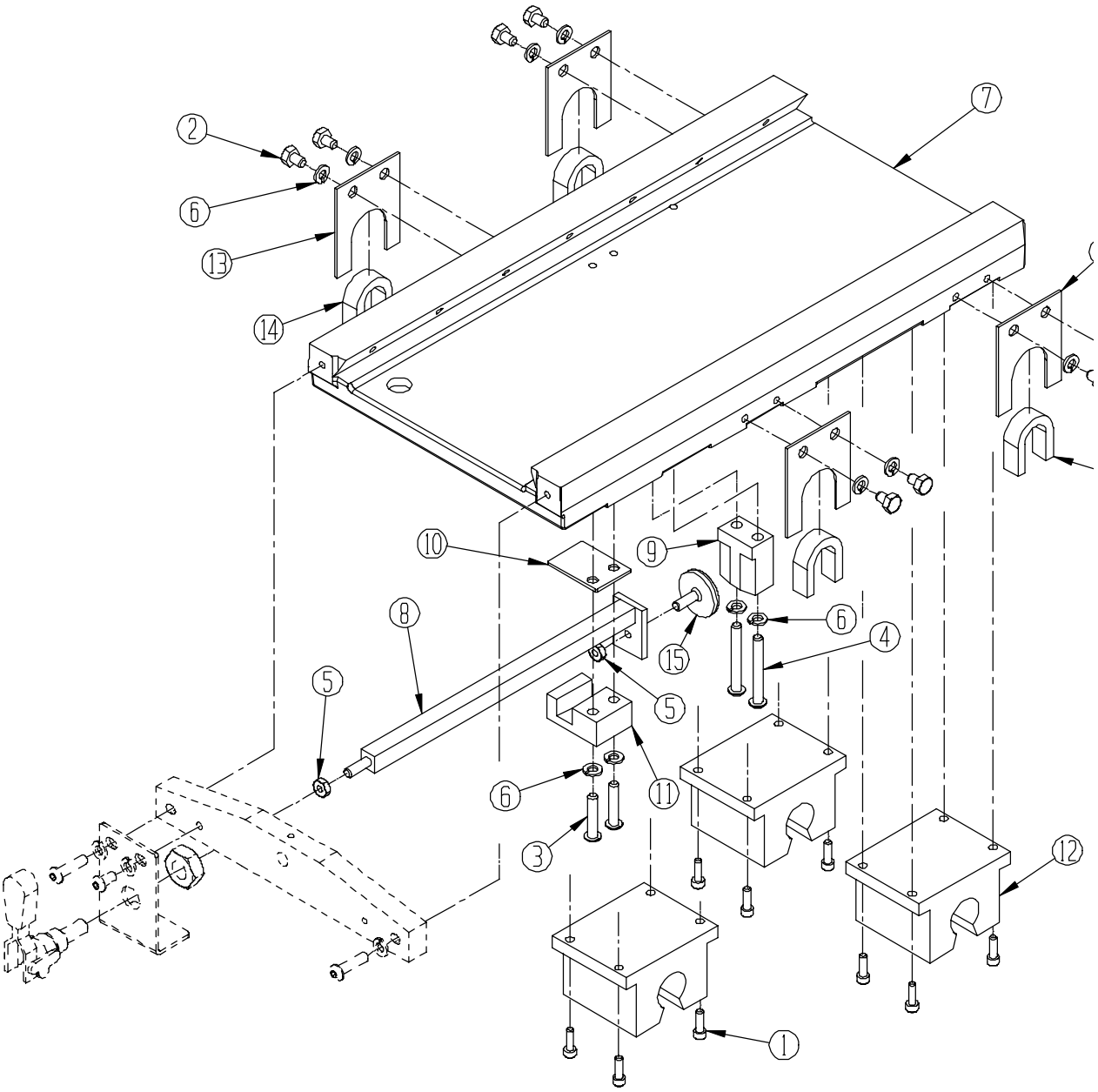
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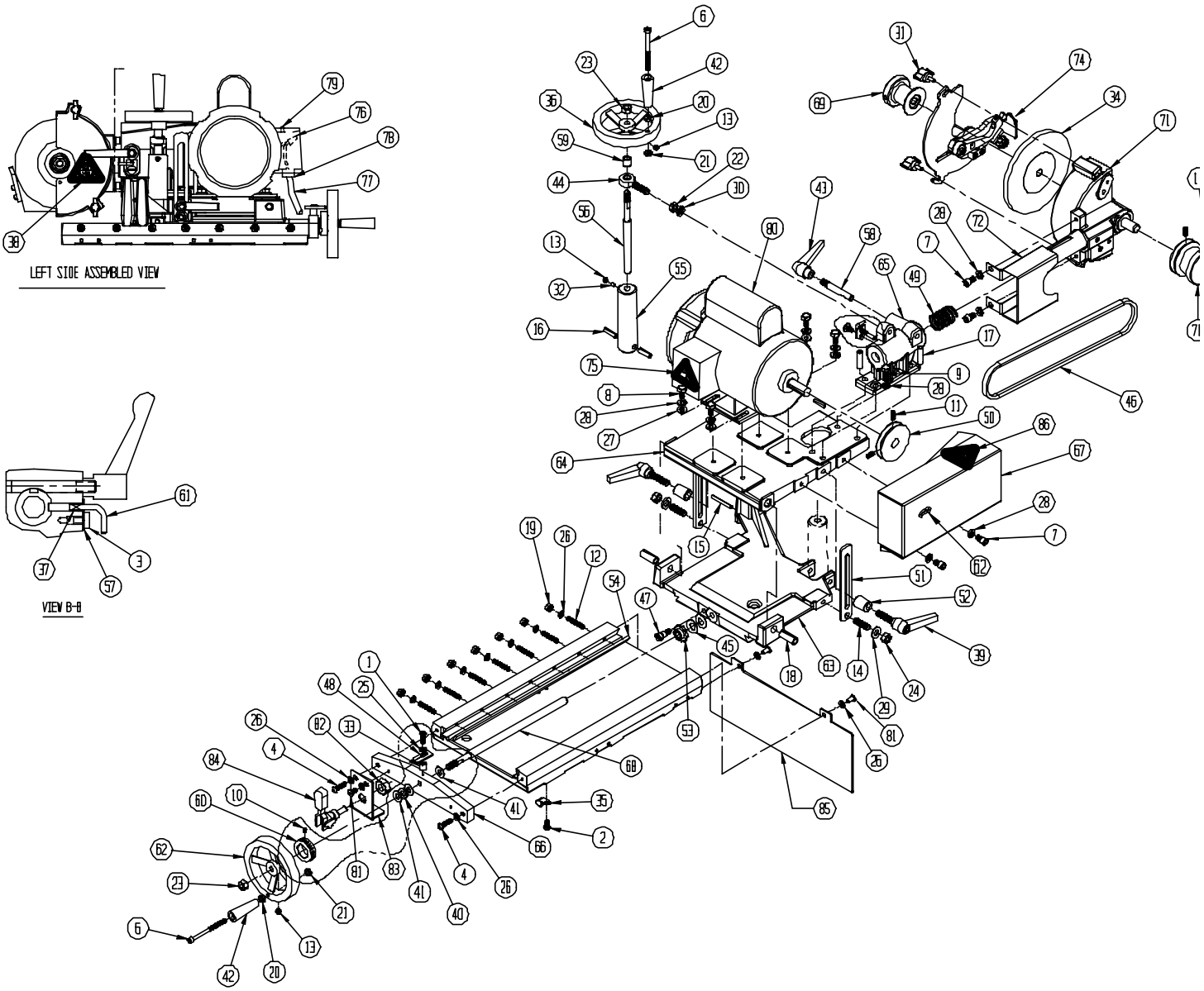
DIAGRAM NO.	PART NO.	DESCRIPTION
1	B191011	#10-24x5/8 Socket Head Cap Screw
2	B250601	1/4-20x3/8 Hex Head Cap Screw
3	B252016	1/4-20x1-1/4 Button Head Socket Cap Screw
4	B253216	1/4-20x2 Button Head Socket Cap Screw
5	J252000	1/4-20 Hex Jam Nut
6	K251501	1/4 Split Lockwasher
7	18065	Carriage Base
8	18571	Traverse Clamp Assembly
9	28187	Traverse Clamp Block
10	28188	Traverse Clamp Spacer
11	28189	Clamp Support Block
12	3709044	Ball Bushing Bearing
13	3969063	Sponge Wiper Holder
14	3969064	Foam Wiper
15	50310	Belt Clamp Tip


LEFT SIDE ASSEMBLED VIEW
VIEW B-B

DIA. NO.	PART NO.	PART NAME
1	B191233	10-32x3/4 Pan Head Machine Screw
2	B190633	10-32x3/8 Pan Head Machine Screw
3	B250819	1/4-20x1/2 Truss Head Machine Screw
4	B251616	1/4-20x1 Button Head Cap Screw
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6	B255011	1/4-20x3-1/8 Socket Head Cap Screw
7	B310811	5/16-18x1/2 Socket Head Cap Screw
8	B311001	5/16-18x5/8 Hex Head Cap Screw
9	B311401	5/16-18x7/8 Hex Head Cap Screw
10	C250420	1/4-20x1/4 Socket Setscrew Cup Pt.
11	C251020	1/4-20x5/8 Socket Setscrew Cup Pt.
12	C252420	1/4-20x1-1/2 Socket Setscrew Cup Pt.
13	C310420	5/16-18x1/4 Socket Setscrew Cup Pt.
14	C372020	3/8-16x1-1/4 Socket Setscrew Cup Pt.
15	H252802	.25 Dia x 1.75Lg Roll Pin
16	H311602	.31 Dia x 1 Lg Roll Pin
17	H372002	.38 Dia x 1.25 Lg Roll Pin
18	H502001	.50 Dia x 1.25 Lg Dowel Pin
19	J251000	1/4-20 Hex Nut
20	J252000	1/4-20 Hex Jam Nut
21	J257000	1/4-20 Thin Locknut
22	J371100	3/8-24 Hex Nut
23	J377000	3/8-16 Locknut Jam Nylon
24	J377100	3/8-16 Locknut Hex Nylok Full
25	K190001	#10 Flat Washer
26	K251501	1/4 Split Lock Washer
27	K310001	5/16 Flat Washer
28	K311501	5/16 Split Lock Washer
29	K370001	3/8 Flat Washer
30	K371501	3/8 Split Lock Washer
31	09394	2-Prong Knob
32	3579109	Nylon Plug 3/16 Dia.
33	3589081	Spacer .191 ID x .438 OD x .43 Lg
34	3700091	Grinding Wheel 6” Dia x .375” Wide
35	3707933	Cord Clip
36	3708148	Handwheel 4.5 Dia
37	3708213	.24 OD x .62 Lg Comp. Spring
38	3708461	RPM Warning Decal
39	3708561	3/8-16x1.56Lg Adj. Handle
40	3709062	Conical Washer
41	3709304	Thrust Washer
42	3709370	Handle
43	3709437	3/8-16 Adj Handle
44	3709463	Rod End Bearing
45	3709620	Conical Washer
46	3709764	V-Belt
47	3709809	.375 Dia x .38 Lg Shoulder Bolt
48	3809047	Clear Indicator
49	3889059	1.13 OD 2.0 Lg Compr. Spring
50	3889088	.62 Bore Pulley
51	3969027	Adjusting Arm
52	3969065	.406ID x 1Lg Steel Spacer
53	6009024	1/2-10 ACME Backlash Nut
54	6009025	Gib Plate
55	6009026	Tapped Pivot Sleeve
56	6009027	ACME Adjusting Shaft
57	6009029	Keeper Plate
58	6009030	Shaft Locking Stud
59	6009031	.386 ID x .56Lg Steel Spacer
60	6059082	Calibrated Ring
61	6009041	Angle Locking Pin
62	6009044	4.50 Dia Modified Handwheel
63	6009083	Grinding Head Slide Base
64	6009084	Grinding Head Pivot Base
65	6009088	Grinding Head Swivel Base
66	6009136	Feed Screw Guide
67	6009216	Rear Belt Guard
68	6009218	ACME Adjusting Shaft
69	6009272	Grinding Wheel Knob
70	6009277	V-Belt Pulley Knob
71	6009587	Grinding Head Arbor Assembly
72	6059023	Front Belt Guard
73	6059028	Spinning Knob
74	6059550	Index Finger Assembly
75	3708448	Electrical Warning Decal
76	3707155	Black Wire Nut w/Setscrew
77	6059081	Grind Motor Cord
78	3707009	Strain Relief
79	3709372	.50 Dia Hole Plug
80	3707991	3/4 HP Motor
81	B250816	1/4-20x1/2 Button Head Cap Screw
82	J627200	5/8-18 Thin Locknut
83	18067	Traverse Belt Clamp Bracket
84	80335	Destaco Clamp
85	18077	Front Bearing Dust Plate
86	3708458	Sharp Warning Decal

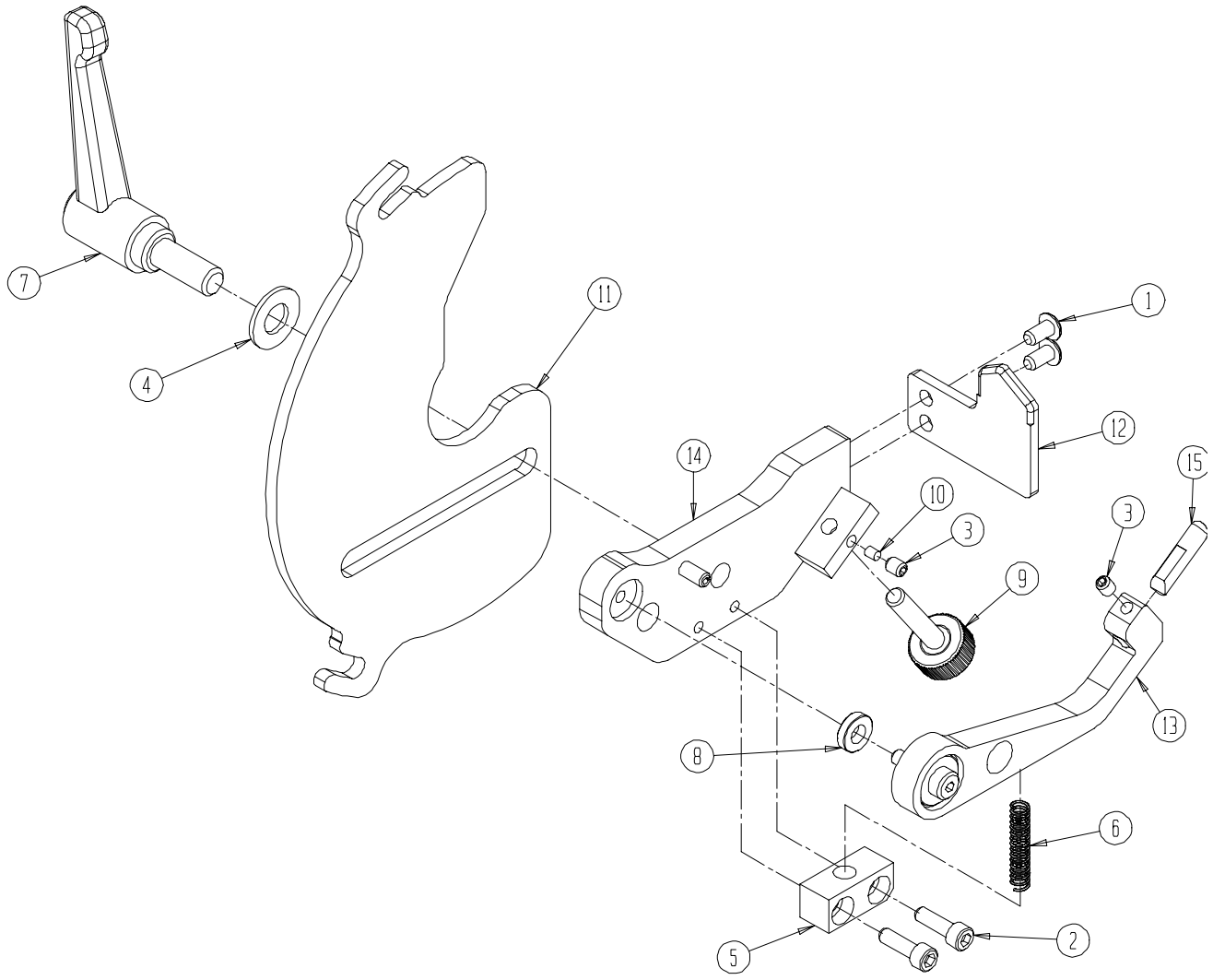
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	B190634	#10-32 x 3/8" Long Button Head Socket Cap Screw
2	B191031	10-32 x 5/8" Long Socket Head Cap Screw
3	C190467	#10-32 x 1/4" Socket Setscrew Nylock Cup Point
4	K310001	5/16 Flat Washer
5	55116	Index Finger Spring Block
6	3708107	Compression Spring
7	3708786	5/16-18 x 5/8" Long Adjustable Handle
8	3708833	Spacer
9	3708854	Knob Assembly
10	3709852	1/8" Diameter Nylon Ball
11	6009271	Grinding Wheel Guard & Finger Support
12	6009276	Fixed Finger
13	6009573	Index Finger Assembly
14	6059523	Finger Support Assembly
15	6059007	Index Stop Pin

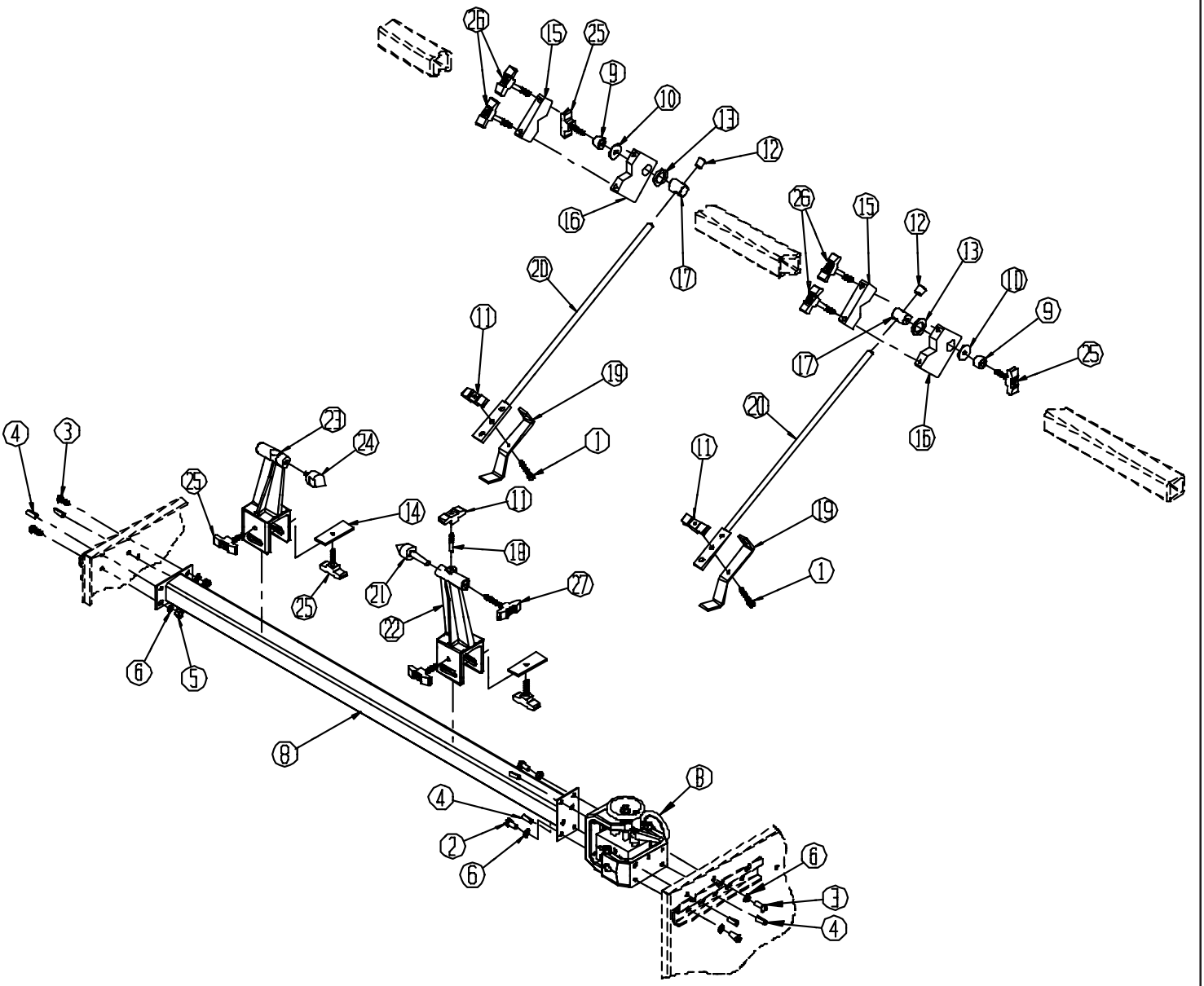
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	A313601	5/16-18 x 2 1/4" Long Hex Head Cap Screw
2	B371201	3/8-16 x 3/4 Long Hex Head Cap Screw
3	B371616	3/8-16 x 1 Long Button Head Socket Cap Screw
4	H371602	.375 Dia. x 1 Long Roll Pin
5	J371000	3/8-16 Hex Nut
6	K371501	3/8 Lockwasher
7	18518	Cross Slide Assembly
8	18573	Tooling Bar Weldment
9	3109026	Spacer - .406 ID x .75 Long
10	3589106	Flat Washer
11	3708262	5/16-18 T - Knob
12	3709258	Bumper
13	3709808	Flat Washer
14	3889066	Center Stand Lock
15	3969094	Top Clamp
16	3969095	Bottom Clamp
17	3969096	Clamp Bar
18	3969160	Locking Stud Shaft
19	3969162	Lip Clamp
20	3969547	Mower Clamp Weldment
21	6009020	Adjustable Center
22	6009221	Adjustable Center Stand
23	6009222	Fixed Center Stand
24	6009517	Fixed Center Assembly
25	6009555	T - Knob Assembly - 3/8-16 x 1.5 Long
26	6009566	T - Knob Assembly - 3/8-16 x 3.25 Long
27	6009577	T - Knob Assembly - 3/8-16 x 2.25 Long

DIAGRAM NO.	PART NO.	DESCRIPTION
1	3708391	Reducer 10:1 Ratio
2	6059024	Motor, Electric 90 VDC .25 HP
3	B251411	1/4-20 x 7/8" Socket Head Cap Screw
4	3709586	Flange Coupler .50
5	3709585	Sleeve Coupler
6	3709584	Flange Coupler 5/8
7	6009217	Adapter, Drive Coupling
8	3708457	Hot Warning Decal
9	09394	Knob - 2 Prong 1/4-20 x .50 Long
10	3709073	Retaining Ring
11	6009051	Drive Adapter 1/2 Square
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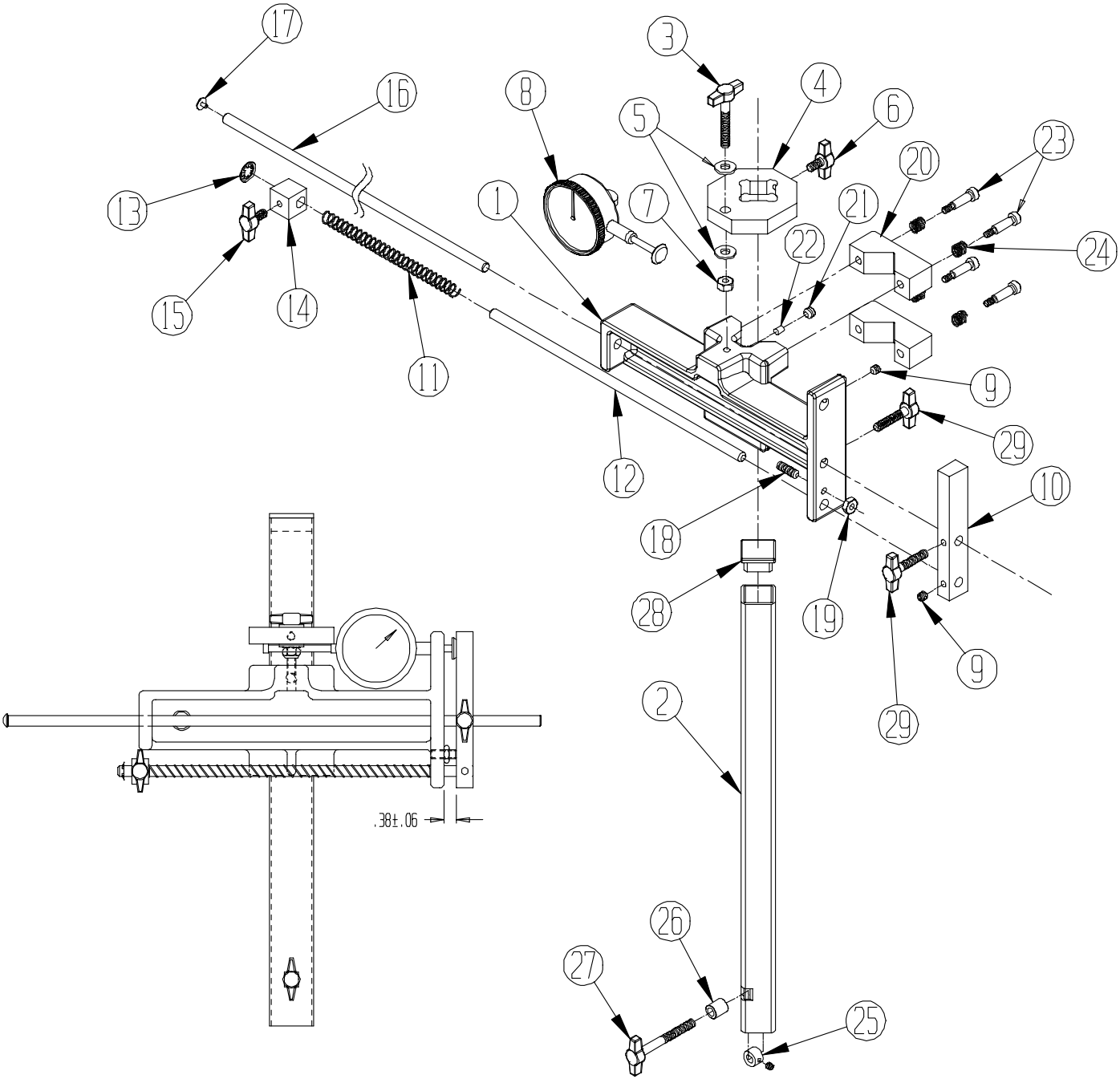
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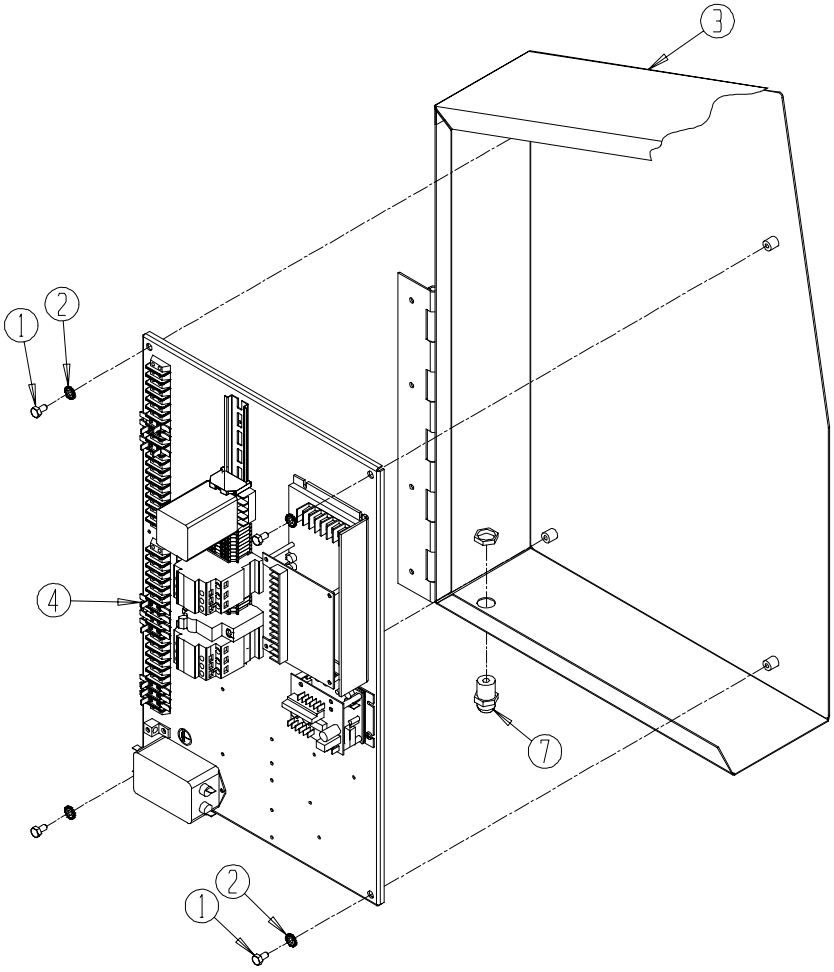
DIAGRAM NO.	PART NO.	DESCRIPTION
1	6009089	Slide, Setup Gage
2	18003	Tube, Gage Slide
3	6009599	Tee Knob Assembly 1.75 lg.
4	6009049	Block, Adjust Slide
5	K250001	1/4 Flat SAE Washer
6	7469533	T-Knob Assembly .88 Long
7	J257100	Locknut--Nylon 1/4-20 Full
8	3579123	Dial Indicator
9	C250420	SKSS, CP-PT, 1/4-20 x 1/4"
10	6009054	Bar, Indicator Stop
11	3709278	Spring--Compression
12	3969109	Spring Guide Rod
13	3709336	Push on Ring
14	3109022	Saddle Stop
15	6009598	Tee Knob Assembly
16	6009055	Rod, Gage Alignment
17	3708540	Domed Anvil 3/8
18	C251220	SKSS, CP-PT, 1/4-20 x 3/4"
19	J252000	1/4-20 Jam Nut
20	6009050	Clamp, Spring Loaded
21	C310420	SSS 5/16-18 x 1/4" CP-PT
22	3579109	Nylon Plug
23	3708453	Shoulder Bolt 1/4" D x 3/4"
24	3708175	Spring
25	3708674	Set Collar 1/4 with SSS
26	6009057	Square
27	6009597	Tee Knob Assembly 2.25 Lg.
28	3708154	Plug--Spacer
29	6009596	Tee Knob Assembly, Nylon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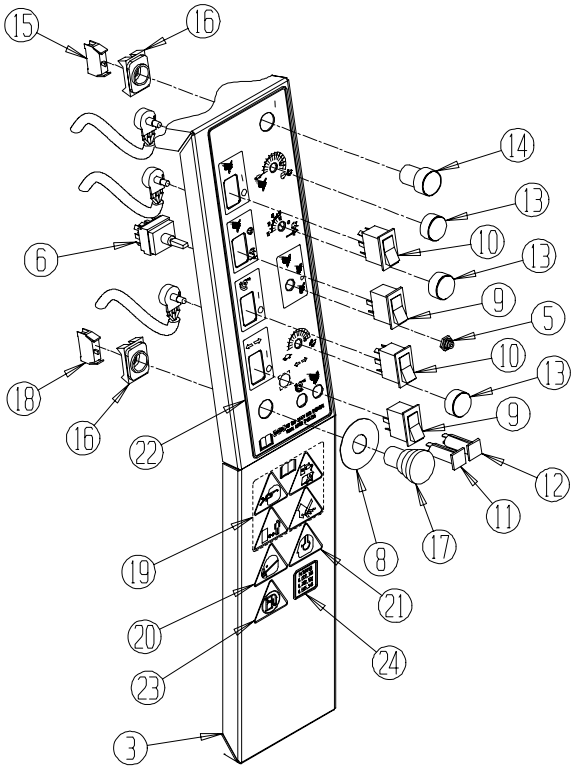
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	D250800	1/4-20 x 1/2" Long Thread Cutting Screw
2	R000536	1/4 Internal Teeth Lock Washer
3	18516	Control Panel Weldment
4	18524	Control Panel Sub-Assembly
5	3707075	Toggle Switch Boot
6	3707080	Toggle Switch
7	3707093	Strain Relief - .43-.55 Cord Diameter
8	3707342	Yellow E-Stop Ring
9	3707367	Rocker Switch - On/Off DPST
10	3707429	Rocker Switch - On/Off DPDT
11	3707443	4-Amp Circuit Breaker
12	3707543	12-Amp Circuit Breaker
13	3707446	Potentiomoter Knob
14	3707564	Green Start Pushbutton
15	3707565	Normal Open Contact Block
16	3707566	Mounting Switch Latch
17	3707567	Push-Pull Red E-Stop
18	3707568	Normal Closed Contactt Block
19	3708703	Safety Symbol Decal
20	3708605	Respirator Warning Decal
21	3708606	Hear Protection Decal
22	3708612	No Fuel Decal
23	3708862	Control Panel Decal
24	3708872	Patent Decal
--	6059050	Traverse Potentiometer
--	6509447	Relief Torque Potentiometer
--	6509446	Spin Speed Potentiometer

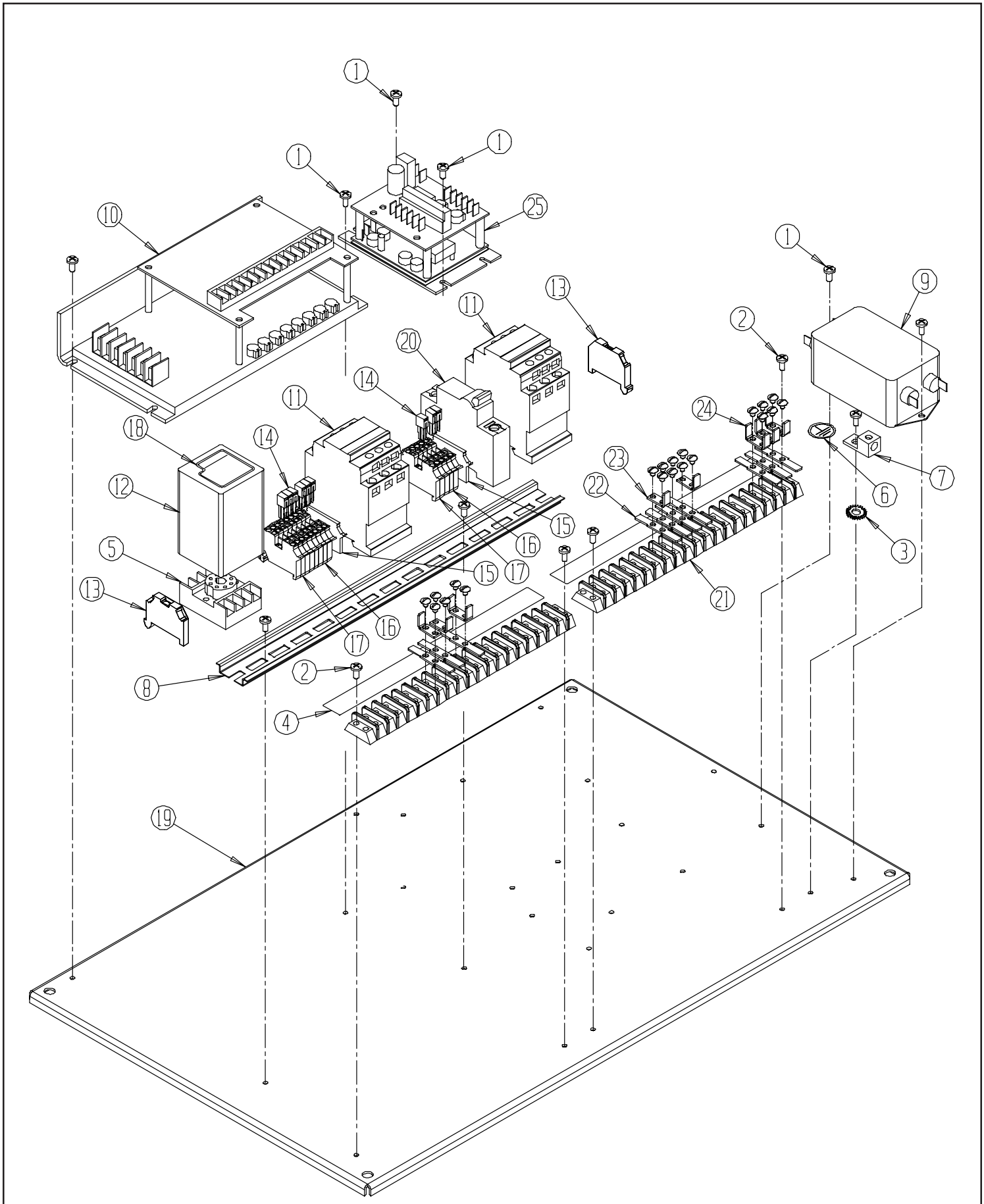
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	D160666	#8 x 3/8" Long Pan Head Tapping Screw
2	D161266	#8 x 3/4" Long Pan Head Tapping Screw
3	R000480	#8 Lock Washer - External Teeth
4	55223	Terminal Strip Decal
5	3707073	8-Pin Socket
6	3707163	Primary Ground Decal
7	3707164	Primary Ground Lug
8	3707378	Din Rail - 14"
9	3707403	Power Line Filter
10	3707550	Traverse Motor Control Board
11	3707556	Magnetic Starter 1 HP
12	3707558	Low Voltage Relay
13	3707625	End Stop - Terminal Block
14	3707626	Jumper - Terminal Block
15	3707627	End Plate - Terminal Block
16	3707628	Terminal Block - Grey
17	3707629	Terminal Block - Blue
18	3708826	LVR Warning Decal
19	6009270	Electrical Sub - Panel
20	3707589	15-Amp Circuit Breaker
21	3707706	Terminal Strip - 19 Pole
22	3707707	Straight Double Spade Terminal
23	3707709	Single 90° Spade Terminal
24	3707708	Double 90° Spade Terminal
25	370524	Spin Drive Motor Control Board
--	3707224	Cable Tie Mount (Not Shown)
--	3707225	Cable Tie 6.5 Long x .18 Wide (Not Shown)
--	3707255	Cable Tie 4.0 Long x .10 Wide (Not Shown)

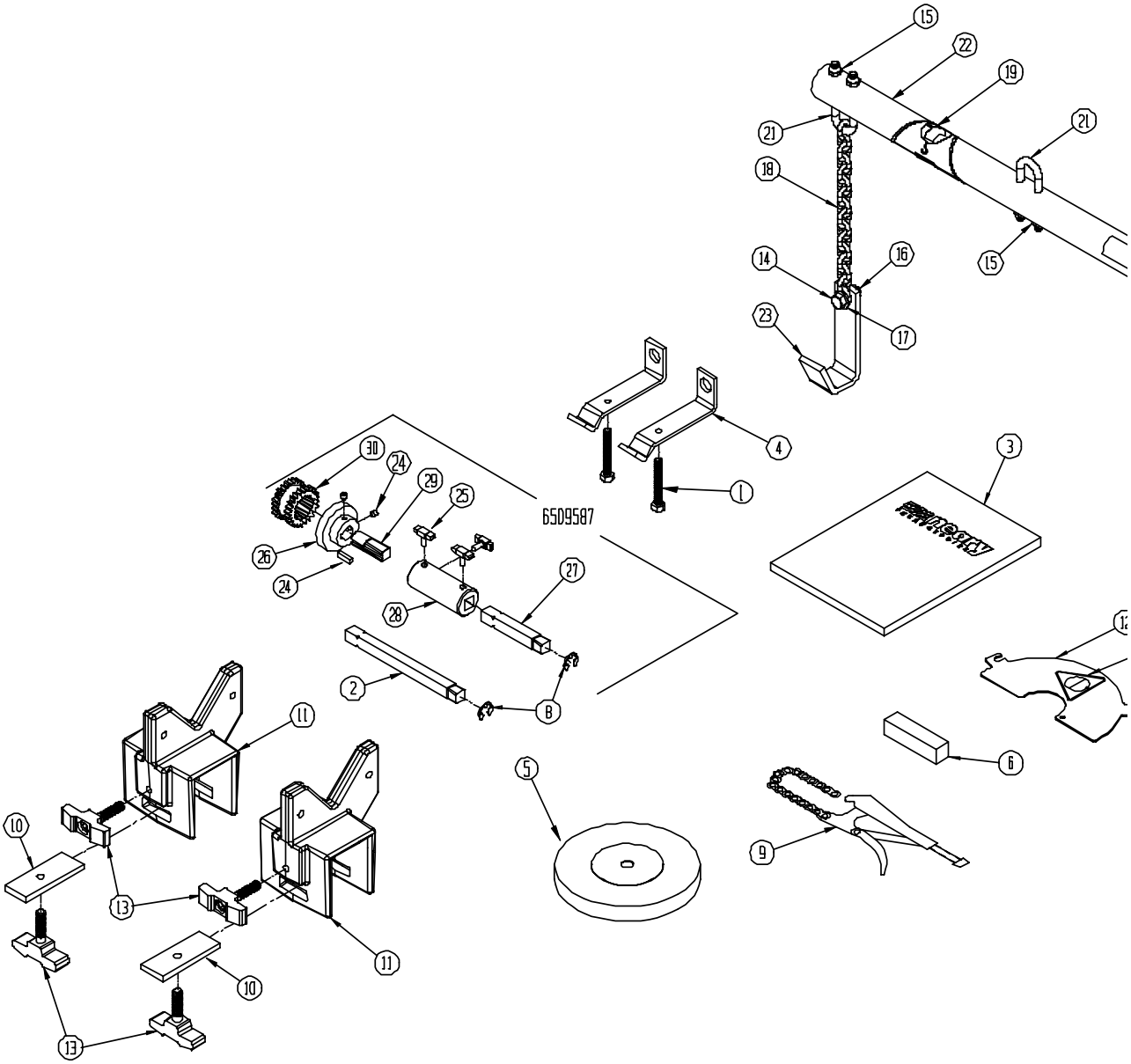
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DIAGRAM NO.	PART NO.	DESCRIPTION
1	A313601	5/16-18 x 2.25 Long Hex Hd Cap Screw - Full Thd
2	18053	Drive Adapter - 10.5" Long
3	18200	Operators Manual
4	3649078	Lip Clamp
5	3700095	Grinding Wheel 6" OD x 1" Wide x .502 Bore
6	3702508	Dressing Stick .75 x .75 x 3.0 Long
7	3708461	Warning Decal 3600 RPM
8	3709073	Retaining Ring - External
9	3709298	Chain Clamp
10	3889066	Center Stand Lock
11	3969017	V - Bracket - Mower Mount
12	6009037	Grinding Wheel Guard
13	6009555	T - Knob Assembly 3/8-16 x 1.5 Long
14	B372011	3/8-16 x 1.25 Long Socket Head Cap Screw
15	J317100	5/16-18 Hex Locknut
16	J377100	3/8-16 Hex Locknut
17	3599028	Flat Washer 1.00 OD x .375 ID x .188 T
18	3649005	Chain
19	3708456	Warning Decal - Boom Capacity
20	3708856	Decal - Spreader Bar
21	3709316	5/16-18 U Bolt
22	6009011	Spreader Bar
23	6009102	Grab Hook
24	R000377	Square Key 3/16 x .75 Long
25	09394	Knob - 2 Prong 1/4-20 x .50 Long
26	3709584	Flange Coupler .625 Bore
27	6009051	Drive Adapter - 3.5 Long
28	6009052	Adapter
29	6009217	Drive Coupling Adapter
30	3709585	Sleeve Coupler

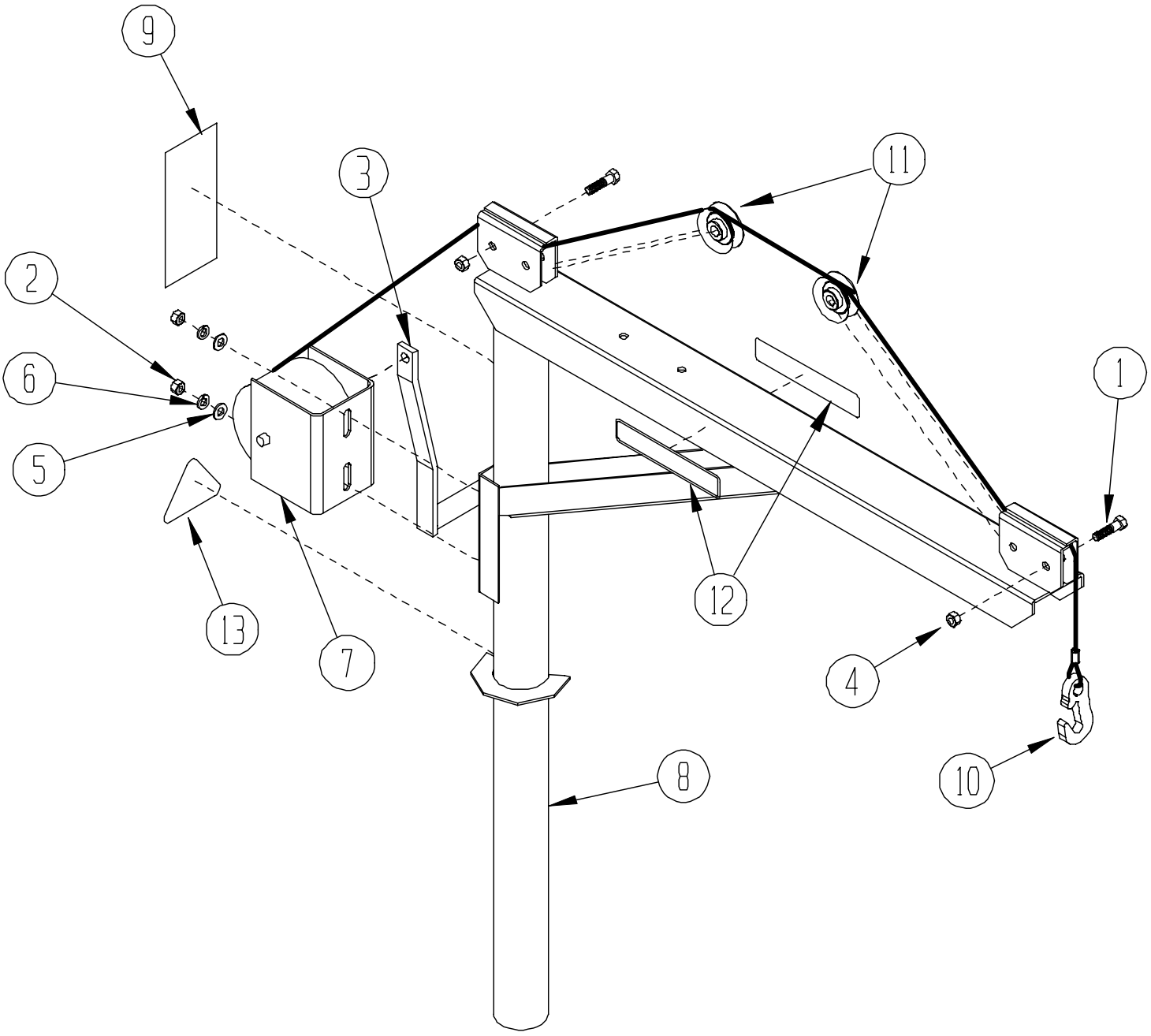
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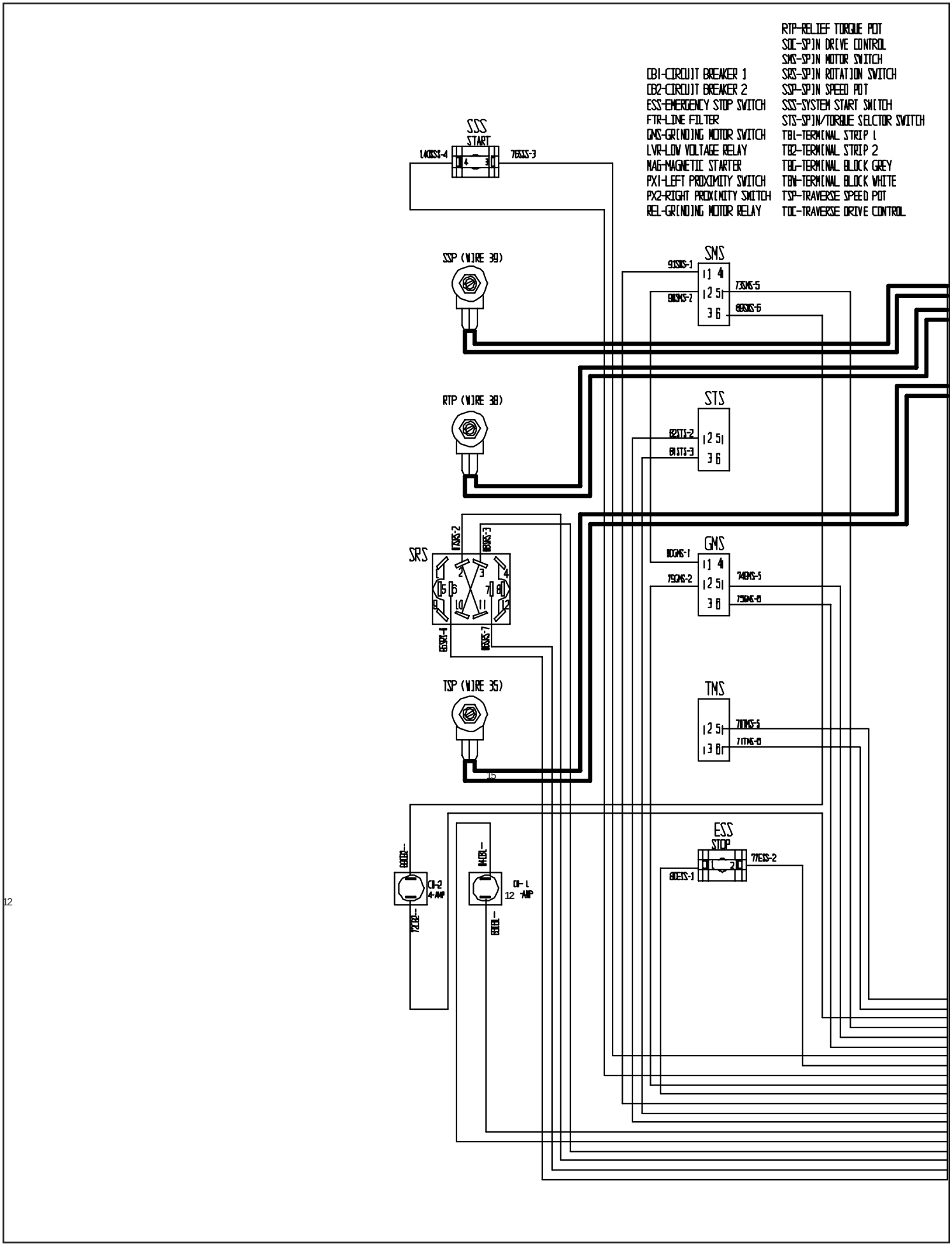
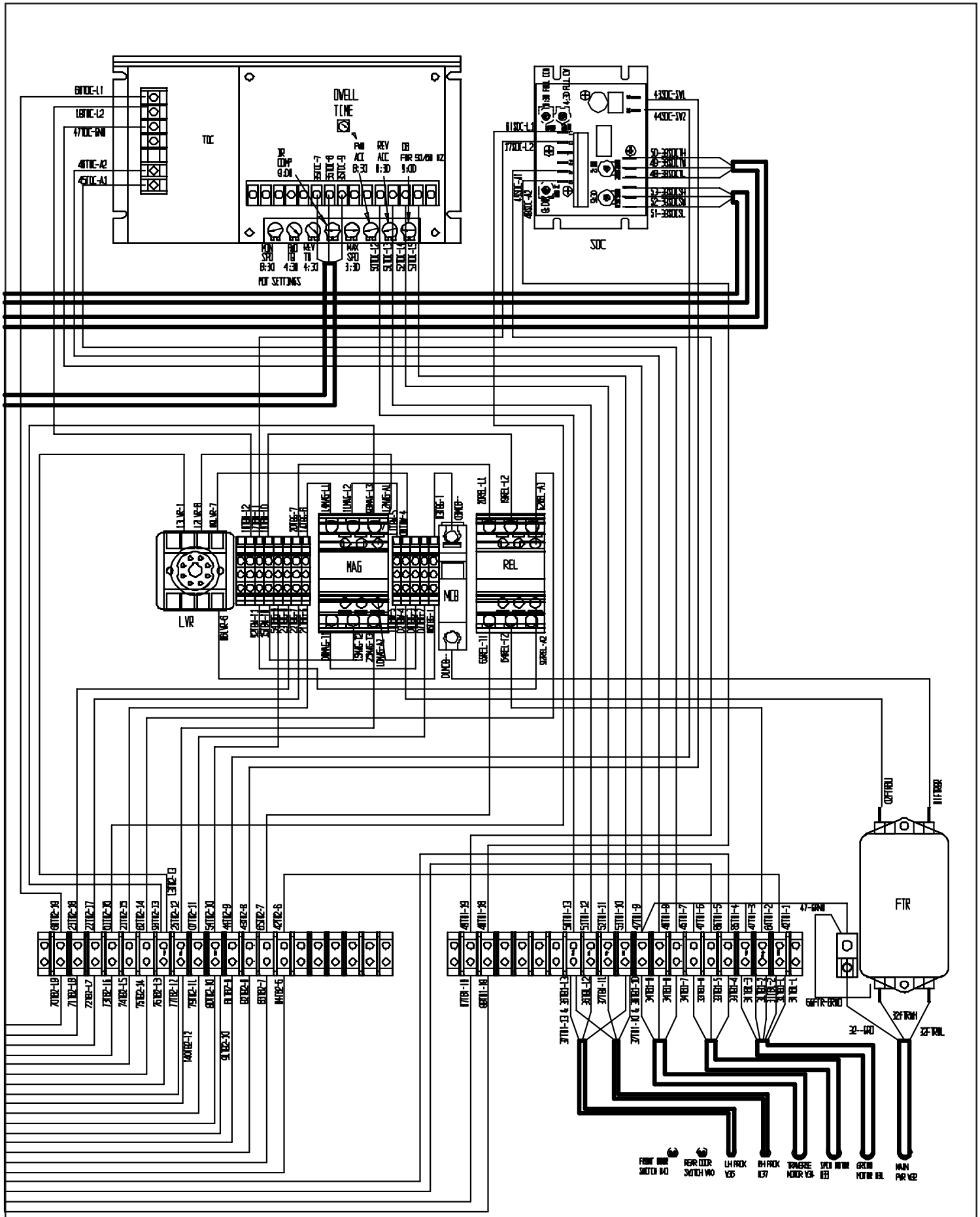
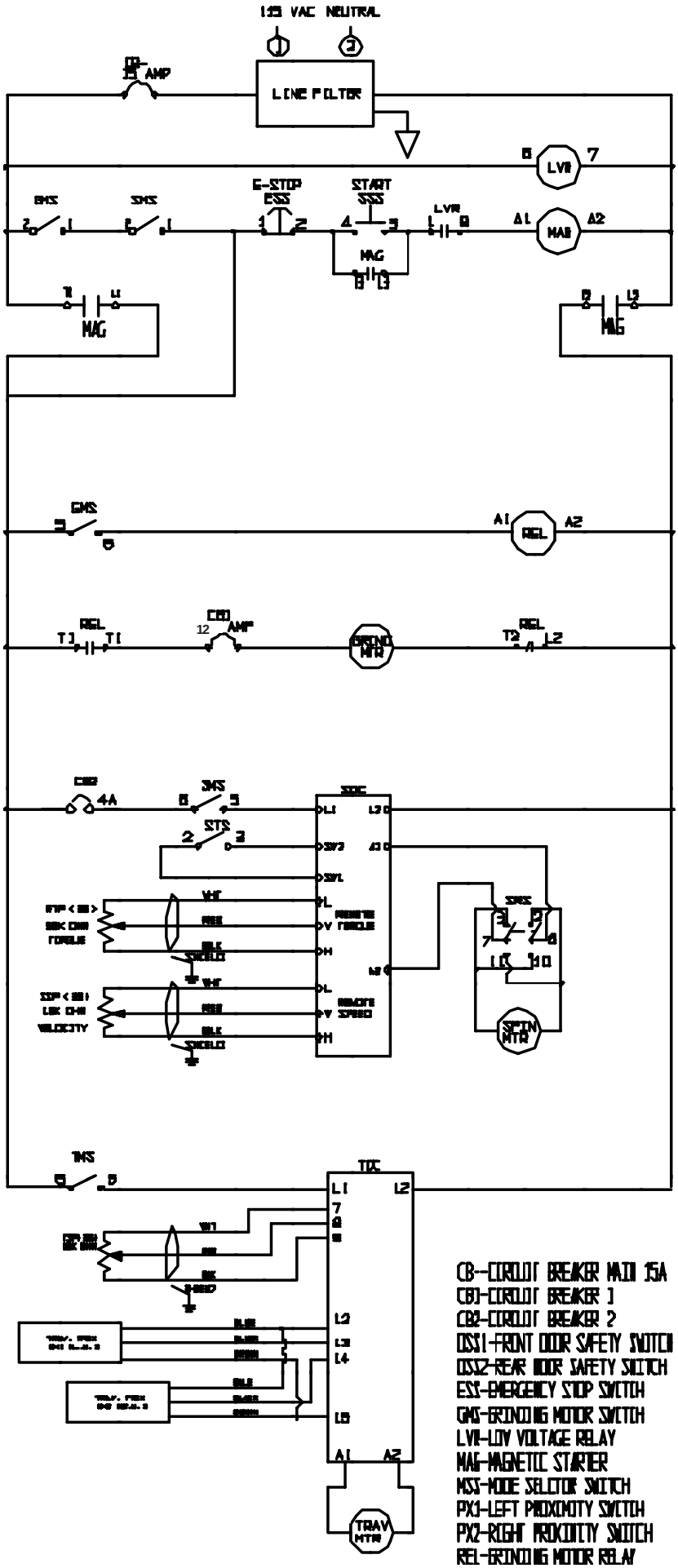
DIAGRAM NO.	PART NO.	DESCRIPTION
1	B372801	3/8-16X1-3/4 Hex Head Cap Screw
2	J371000	3/8-16 Hex Nut
3	3708645	7" Winch Handle
4	J377100	3/8-16 Locknut Nylon Full
5	K370001	3/8 Flat Washer
6	K371501	3/8 Split Lockwasher
7	3708578	Winch
8	6059527	Boom Weldment
9	3708456	Boom Capacity Warning Decal
10	3709407	Hook & Cable Assembly
11	3709795	Pulley
12	6309036	Boom Capacity Warning Decal
13	6309037	Winch Warning Decal

18400 WIRING DIAGRAM




TDC
SDC
MAG
REL
MCB
LVR
FTR
POT SETTINGS
FRONT DOOR SWITCH
REAR DOOR SWITCH
LH PROX
RH PROX
TRANSFER MOTOR
GROUND
MAIN PWR



CB--CIRCUIT BREAKER MAIN 15A
CB1-CIRCUIT BREAKER 1
CB2-CIRCUIT BREAKER 2
DSS1-FRONT DOOR SAFETY SWITCH
DSS2-REAR DOOR SAFETY SWITCH
ESS-EMERGENCY STOP SWITCH
GMS-GRINDING MOTOR SWITCH
LVR-LOW VOLTAGE RELAY
MAG-MAGNETIC STARTER
MSS-MODE SELECTOR SWITCH
PX1-LEFT PROXIMITY SWITCH
PX2-RIGHT PROXIMITY SWITCH
REL-GRINDING MOTOR RELAY

RTP-RELIEF TORQUE POT
SDC-SPIN DRIVE CONTROL
SMS-SPIN MOTOR SWITCH
SRS-SPIN ROTATION SWITCH
SSM-SAFETY SWITCH MONITOR
SSP-SPIN SPEED POT
SSS-SYSTEM START SWITCH
STS-SPIN/TORQUE SELECTOR SWITCH
TDC-TRAVERSE DRIVE CONTROL
TMS-TRAVERSE MOTOR SWITCH
TSP-TRAVERSE SPEED POT